THE TEXTILE MANUFACTURER

No. 1017. Vol. 85 Two Shillings and Sixpence September, 1959

Notes of the Month

U.K. IMPORTS FROM INDIA AND PAKISTAN

THE Cotton Board announce that an agreement on ceiling figures for imports of cotton manufactures from India and Pakistan for retention in the U.K. home market has been concluded in principle. This agreement for a period of three years, comes into force January 1, 1960. The figures are the equivalent of 175 million sq. yds. in the case of imports from India and 38 million sq. yds. in the case of Pakistan. The agreement is subject to the existence of arrangements for ceiling figures for imports of cotton manufactures from Hong Kong.

Following the Cotton Board's announcement, the President of the Board of Trade, said: "I welcome the successful outcome of the negotiations between the Cotton Board and the cotton industries of India and Pakistan for the limitation of imports into the U.K. With the arrangements already in force for Hong Kong, this will assure Lancashire of a period of stability as far as Asian Commonwealth imports are concerned. The success of these negotiations should add greatly to the confidence with which the cotton industry tackles the problems of re-equipment and modernisation."

COTTON LEVIES AND PRICES

IN a recent statement, the special committee of the Cotton Board, appointed under the Cotton Industry Act, 1959, point out that consideration has been given to a number of complaints which have appeared recently in the press regarding prices, supplies and delivery dates in the cotton industry, particularly in so far as they have been attributed to the effects of the cotton spinning, doubling, and weaving reorganisation schemes. The special committee have had discussions with representatives of all sections of the industry regarding the matters which have been raised and the statement is one outcome of these talks. It reads: "It is generally accepted that for some time past margins in all sections of the industry have been uneconomic but it has also been stated on a number of occasions from some quarters that prices would have to be raised as a result of the levies payable by firms in the cotton industry which are going to continue in business. The Special Committee wish to state that they do not consider that the cost of the levies can in itself significantly affect prices; on the basis of the information at present available it has been calculated that the cost of these levies will amount to less than ¼d. per lb. of production of yarn, and to under ¼d. per yard in the case of woven cloth." The committee emphasises that these are average figures and that in certain cases the cost will be more, just as in other cases it will be less. Moreover, the figures take no account of the saving in costs which it is expected will in due course result from the improved operating efficiency which the reorganisation schemes should achieve.

An earlier statement by Lord Rochdale (chairman, Cotton Board) revealed that a high proportion of the machinery to be scrapped under the reorganisation schemes was already out of use last April and the figures below give the latest available information regarding the effect of the schemes:—

Machinery in use April 1959	Machinery left after scrapping is completed	% reduction
16·5 million mule equivalent spindles	13·5 million mule equivalent spindles	18·2
1,015,000 doubling spindles	1,046,000 doubling spindles	—
183,000 looms	153,000 looms	16·4

"Included in the 153,000 looms which will remain after scrapping are about 45,500 automatic looms. According to the latest figures available to the Special Committee (June 1959) 7,000 of these looms were working three shifts, 20,000 two shifts, at least 2,500 were idle and the rest were working one shift. It will therefore be seen that the reduction in productive capacity of 30,000 looms shown above could readily be replaced by additional shift working of automatic looms already installed. Such statistics as are available indicate that only about 1 million mule equivalent spindles are working more than one shift."

"In these circumstances and after full discussion with representatives of the industry the special committee are satisfied that there should be no undue interference with supplies as a result of the scrapping of machinery on the scale proposed. The scrapping will be spread over a period of six months and this should give firms remaining in the industry time to make necessary adjustments to their production programmes to meet any increased demand which may be put upon them. The special committee will continue to pay close attention to the situation and will confer as necessary with the representative bodies of the various sections of the industry."

THE INTERNATIONAL COTTON CONFERENCE

ONE HUNDRED AND TWENTY delegates from Western Europe, the U.S.A., the United Arab Republic, Japan and Australia met recently in Vienna for the annual meeting of the International Federation of Cotton and Allied Textile Industries. In his opening address Dr. W. T. Kroese (Netherlands), president, referred to structural change taking place in the cotton textile industries of the world. The setting-up of highly competitive cotton textile industries in developing countries had created difficult problems for the cotton industries in Western Europe and the United States. It would, he said, be one of the most important tasks of the future to re-establish equilibrium in the cotton and allied textile industries of the whole world.

The committee for European Affairs discussed the problems with which the textile industry is faced as a result

of Europe's division into two integrated economic areas. This development can cause only great concern to the industry, as it threatens to break the traditionally wide ramifications of foreign trade in textiles for Western Europe. The cotton textile industries of Western Europe, therefore, consider an early association of the European Economic Community with the proposed European Free Trade Association imperative; the foreign trade policies of both integrated areas should also be harmonised as much as possible. One of the technical difficulties is the question of certificates of origin. In this connection the textile industry can only accept the so-called cumulative processing definition; i.e. a textile end-product must be spun, woven and finished in the same country in order to become eligible for preferential treatment within the area.

The raw cotton merchants' committee noted the initiative taken by some Latin American producer countries to stabilise raw cotton prices by commodity controls. From the consumers' point of view, such measures must be rejected, as they are neither technically feasible nor economically desirable. Inter-governmental controls over the price formation of raw cotton on the world markets will bring prices to an unrealistically high level, when they will be uncompetitive with the prices of man-made fibres. The International Cotton Federation, in a resolution, urges all raw cotton producing countries to direct their resources into more constructive channels, by supporting endeavours to increase consumption through market research and sales promotion. The removal of the obstacles which are still in the way of the free functioning of futures markets will also contribute to the stabilisation of prices. The committee also expressed itself on matters pertaining to quality maintenance and improvement of raw cotton of various growths.

The committee for man-made fibres examined problems connected with the terminology and standardisation of man-made fibres. Some concern was expressed regarding the ever-increasing number of labels and trade-marks, which tend to cause confusion among the consuming public.

The possibilities of international legal protection of textile designs were carefully examined. In view of the administrative and technical difficulties involved, the International Cotton Federation believes that the protection of textile designs on an international level can only be achieved through moral obligation. The federation will work out proposals to that effect. Among the technical subjects discussed at the meeting were the standardisation of the terminology and description of cloth constructions, the progressive standardisation of cloth widths, and the promotion of textile research and training in textile technology.

The report by the chairman of the federation's committee for European Affairs, Mr. Rudolf Seidl (Austria), aroused particular interest. The discussion revealed that the interests of the cotton textile industries of Western Europe, the U.S.A. and Japan are moving closer together, in so far as their greatest threat comes from countries with state-controlled economies and politically inspired foreign trade monopolies. The annual meeting was characterised by better mutual understanding and a strong will to common solutions, particularly in matters likely to increase consumption. In view of the general improvement of the state of trade in the textile industries of the world, it is hoped that the current structural change may proceed without causing too great a disturbance. Among cotton textile industrialists, there is a strong desire for close co-operation. The American Cotton Manufacturers' Institute, the central trade association of the American textile industry, was unanimously accepted as a member of the International Federation of Cotton and Allied Textile Industries.

JUTE FIBRE FROM BURMA

THE first commercial shipment of jute fibre from Burma recently arrived in Dundee, the processing centre of the U.K. jute industry, and further supplies are on their way to this country. It is approximately 127 years ago since jute from India was first introduced to Dundee textile manufacturers who gave the world a new industry when they successfully spun the fibre on machinery. Since 1947, Dundee has been dependent for its supplies of raw jute on Pakistan, a highly monopolistic seller. Welcome has been given in Dundee to the prospects of an additional and regular source of good fibre for the production of high-quality jute goods. The Burmese Government are encouraging jute growing under a special programme. During 1959 it is hoped to export a maximum quantity of 6,000 tons to both Dundee and Continental jute industries. Dundee alone uses about 140,000 tons of raw jute per year so that Pakistan will remain the main supplier.

Jute has been cultivated in Burma for many years for local domestic consumption and it is only very recently that serious attempts have been made to develop the crop on a commercial basis. The jute expansion project is directed by the Government of the Union of Burma Agriculture and Rural Development Corporation (A.R.D.C.). Jute policy is under the direction of the Board of the A.R.D.C. To carry out the Board's policy there is an executive jute project officer who, with his staff, controls a district organisation divided into approximately 33 different districts. In 1958 about 11,000 tons of fibre was produced which was approximately double the crop of 1957. It is expected that this season 1959 there will be a further considerable increase due to the larger acreage under cultivation. The intention is eventually to produce a crop of about 100,000 tons per year. The principal growing area is the delta area of the Irriwaddy.

A considerable proportion of the Burma jute crop is high-quality fibre and, with proper handling and assortment, very suitable for export. Burma has a modern jute mill industry which is mainly interested in the production of sacking, and it is therefore wasteful to use the high-quality fibre for this purpose. On the other hand, Burma is able to process all the low-quality fibre she produces and import the balance to meet the requirements of her mill industry. It is anticipated that the bulk of her exports will largely be made up of Mill Standard Lightning/Export Firsts and higher grades. Meantime, the jute is assorted into Grades A, B, C, D and E, Grade E being the lowest grade for export.

Up-to-date export has been limited to initial trial parcels for experimental purposes, but as a result of the experience gained from their first shipments a more advanced programme for assorting, grading and packing has now come into operation. The first shipment of this improved standard has arrived in Dundee and from inspection of this delivery it is evident that considerable progress has been made in the selection, cleaning and general handling of the jute. Further shipments have been made and it is now hoped to continue a regular, though of necessity, a relatively small supply of Burma jute to both Dundee and the Continent. No pucca baling press is meantime available in Burma and export will be made in Kutcha bales of 125 lbs. each until there are arrangements for the installation of a modern press which it is hoped will be in operation for packing of the 1960 crop. This season 1959 it is aimed to export a maximum quantity of 6,000 tons of raw jute.

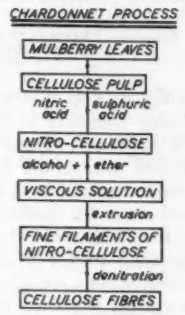
Rayon: Development, Manufacture and Uses

"I have often thought that probably there might be a way to make an artificial glutinous composition much resembling, if not fully as good, nay better than, the excrement or whatever substance it may be, out of which the silk-worm wire-draws his clew"—Dr. Robert Hooke

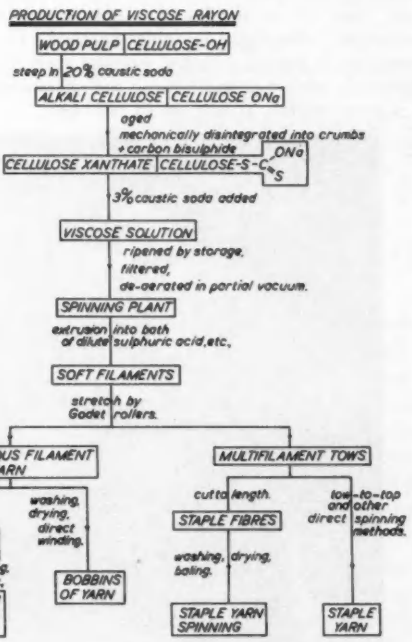
J. W. S. HEARLE, M.A., Ph.D., A.Inst.P.*

FOR thousands of years man has made excellent use of those fibres which he originally found on plants and animals but, for hundreds of years, scientists and inventors have also considered the possibilities of making textile fibres. Rayon—a fibre which began life as an expensive substitute for silk—was the first achievement of this dream. Other fibres followed, and today, rayon plays the same part in the world of man-made fibres as cotton plays in the world of natural fibres. It is cheap, versatile, produced in large quantities, has somewhat similar properties, and is made of cellulose. Of the natural fibres, only silk was available in the long lengths which gave the sheer sheen of continuous filament fabrics. The possibility of duplicating these luxurious, beautiful and costly fabrics provided the chief incentive for the production of man-made fibres. In the 19th century, many trials were made; but commercial success came first to Count Hilaire de Chardonnet, who took out patents in 1884. He was a pupil of Pasteur, and a student of diseases of the silkworm. In making a fibre, he followed the silkworm as closely as possible. Starting with the same raw materials—mulberry leaves—he prepared from them a viscous solution of nitro-cellulose, which could be squirted through fine holes and solidified to give fibres. These fibres were highly inflammable and had to be converted back to cellulose before use. The Chardonnet process, illustrated schematically in Fig. 1, soon became obsolescent but some production—using other sources of cellulose—continued, until the last nitro-cellulose factory was destroyed by fire in Brazil in 1949.

In 1890, patents for the cuprammonium process were taken out. In this method, cotton linters are dissolved in a cuprammonium hydroxide solution, before extrusion into fibres. Cuprammonium rayon is not now a fibre of great commercial importance: production has always been small and ceased in Britain in 1955, but it continues in Germany. Its main advantage was that very fine fibres could be produced. A year later, in 1891, the viscose process was patented. Now it accounts for the bulk of the world's supply of rayon. In Britain, the production of viscose rayon was started by Courtaulds at Coventry in 1905. These new fibres—at first known as "artificial silk"—soon proved to be more than an artificial substitute, and the name was changed to *rayon*. As other man-made fibres were produced, there was a tendency to call them all rayons. However, this terminology proved unsatisfactory, and the use of the word rayon is now limited to fibres made of regenerated cellulose.



(right) Fig. 1. The Chardonnet process



(below) Fig. 2. Viscose rayon production

Production of Viscose Rayon

The production of viscose rayon is illustrated schem-

* *Manchester College of Science and Technology.*

Fig. 3(a). Sheets of wood pulp being loaded into a steeping press where they will be steeped in caustic soda

atically in Fig. 2, and by the photographs in Fig. 3. The cellulose, usually in the form of wood-pulp, is first turned into cellulose xanthate in order to produce the viscose solution which can be extruded through the holes of a spinneret into a bath in which it coagulates. The filaments must then be hardened by stretching, freed of residual chemicals, and dried. The later stages of the process vary according to the type of material being produced. The conventional method of making continuous filament yarn is to wind the yarn into loose 1 lb. cakes, before the final washing, bleaching, and drying. This method is still widely used, but it is obsolescent and any new plant uses *continuous spinning*. In this method the yarn, after extrusion, is passed round a series of reels on which all the chemical, washing, and drying operations are performed; it is then wound directly on to bobbins.

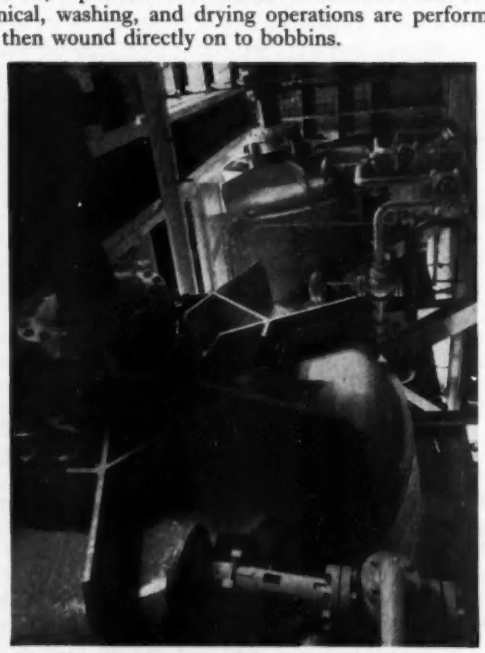


Fig. 3(c). Large churns, in which alkali cellulose is churned with carbon bisulphide to produce cellulose xanthate

Fig. 3(b). After steeping, the sheets of alkali cellulose are ground into a form known as "crumbs." A grinder is here being emptied

In making rayon staple, the filaments are chopped into short fibres after extrusion, washed and dried, and then compressed into bales. The production of staple fibre is cheaper because each spinneret can be used to form a heavy tow or rope containing thousands of filaments; and also because it is unnecessary to have such precise control of uniformity. The complete disorganisation of the staple fibres which have to be reorganised into a spun yarn by spinning concerns, seems a pointless procedure. Consequently, several methods of spinning staple yarn direct from a multi-filament tow have been developed. If these ultimately prove a complete commercial success, tow may come to replace staple fibre as the usual form for marketing rayon for spun yarns. In addition to the distinction between continuous filament yarns and staple fibres there are also many variations in the type of fibre produced. Apart from such obvious possibilities as changes in the fibre denier and the number of filaments in a yarn, the fibre properties can also be altered. Over the years, preparation of the viscose solution has been modified and consistently improved. By the addition of pigments and other substances, the colour, lustre, and other properties of the resulting fibres can be varied. The amount by which the

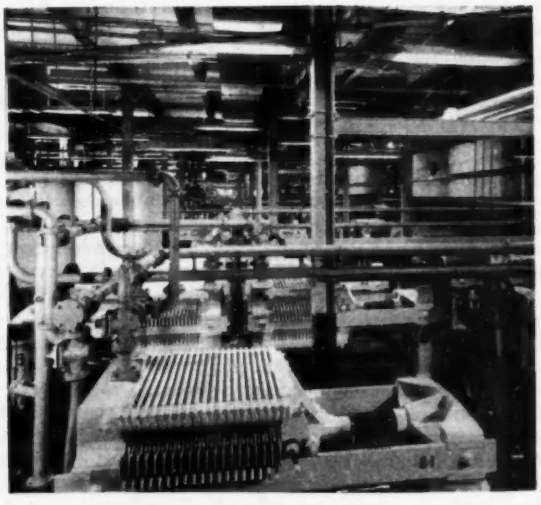
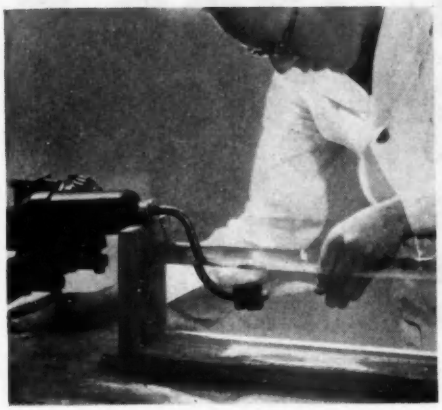


Fig. 3(d). A viscose "cave" where viscose is filtered, blended, ripened, and de-aerated before spinning



(left) Fig. 3(e). A laboratory demonstration on filament formation by the extrusion of viscose into a sulphuric acid bath

(right) Fig. 3(f). Continuous spinning (Carrickfergus)

Table. 1. Growth of Production of Rayon (Million lb. per annum)

Year	Continuous filament			Staple fibre		
	U.K.	U.S.A.	World	U.K.	U.S.A.	World
1912 ..	3·0	1·1	19·8	—	—	—
1920 ..	6·0	10·1	33·1	—	—	—
1930 ..	47·0	127·3	451·1	0·8	0·3	6·3
1940 ..	111·3	390·1	1181·2	57·3	81·1	1281·5
1945	85·2	623·7	901·5	52·8	168·4	504·1
1950 ..	198·1	953·9	1935·6	173·2	305·5	1575·7
1954 ..	214·7	706·9	2053·6	228·1	378·9	2465·7
1956 ..	194·0	749·6	2233·9	238·0	689·9	2991·5

Figures from: "Economics of Man-Made Fibres" (D. C. Hague) and "Industrial Fibres".

(Totals include acetate and, in some cases, small amounts of nylon.)

filaments are stretched after extrusion can also be changed. Some fancy rayon yarns can be made by varying the rate of pumping the viscose solution to the spinneret, or by extruding through holes of different shapes. But the most important feature is the chemical reaction that occurs when the cellulose is regenerated from cellulose xanthate. If the conditions under which this takes place are varied—e.g., by altering the composition of the bath into which the filaments are extruded—pronounced changes in fibre structure and properties are obtained. This is actually the basis of the method for making the new super-rayons for tyre cords. Rayon is now manufactured in many countries and production has risen rapidly. Second only to cotton in the weight of fibre now produced, Table 1 gives some comparable figures of production from 1912. In Britain, by far the greatest production is by Courtaulds Ltd., but there are, of course, other smaller producers. It is interesting to note that the rising production has been accompanied by steady fall in the cost of rayon, as shown in Table 2. The increases in price in the post-war years are less than the general level of wage and price increases.

Fig. 3(g). "Doffing" machine producing viscose high tenacity rayon

Table 2. Rayon Prices. (pence per lb.)

(a) Compared with Cotton

Year	Yarn		Fibre	
	150 den. rayon	32s cotton	Rayon staple	American cotton
1920 ..	200	50	—	—
1923 ..	108	23	—	—
1930 ..	52	12	36	6
1935 ..	32	10	15	7
1939 ..	33	11	10	6
1946 ..	48	25	14	14
1950 ..	47	60	19	39
1954 ..	57	55	24	33
1959 ..	60	49	24	—

(b) Varieties of Rayon

Standard rayon on cakes, bright	
100 den.	69
300 den.	49·5
Dull ..	1·5 extra
Spun-dyed	19 to 30 extra
"Tenasco"	
100 den.	88
400 den.	58·5
Continuous spun—triple 'A'	
100 den	73·5
"Fibro" (1·5 to 50 den.)	22·75
Crimped "Fibro" ..	25
Strong "Fibro" ..	27
"M55"	30
"Fibro-Duracol"	28-40, depending on colour
Cuprammonium ..	29·5 (f.o.b. German port)

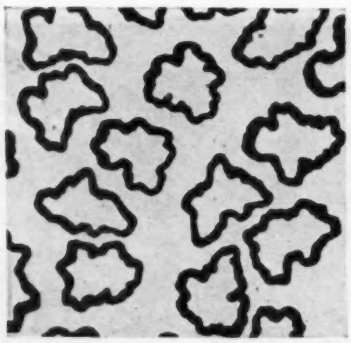


Fig. 4(a). Continuous filament yarn

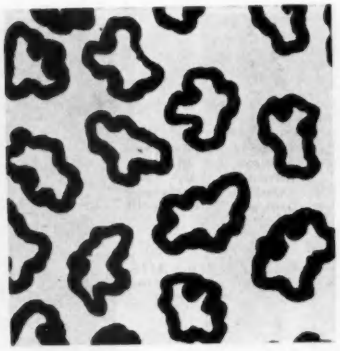


Fig. 4(b). "Tenasco"

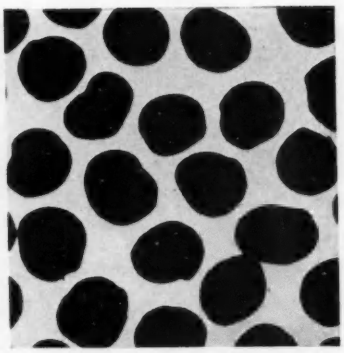


Fig. 4(c). "Tenasco Super 105"

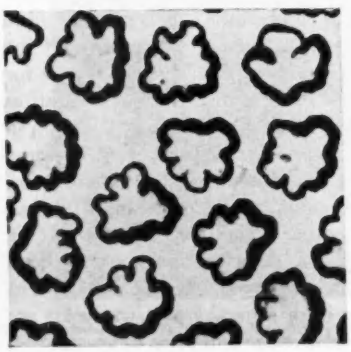
Constitution and Form

Like cotton, rayon is composed of cellulose molecules arranged so that they pass through both closely and regularly packed crystalline regions and looser, disorganised non-crystalline regions (see "T.M.," June page 258). Due to the degradation occurring during preparation of the viscose solution, the molecules are not as long as those in cotton; on the average, they are composed of about 500 glucose units. Nor is the proportion of crystalline material so great—it is usually about one-third of the total. Due to the extrusion and stretching, the molecules are lined up roughly parallel to the length of the filaments, but the degree of this orientation is increased when more stretch is imposed by the godet rollers in spinning. Rayon fibres commonly have the serrated cross-section shown in Figs. 4a and 4b. This is due to the initial formation of a skin on the extruded filaments, followed by its collapse as the core coagulates, and shrinks. Dyeing fibre cross-sections show the skin much more clearly because it does take up less dye. The internal structure of the skin is different from that of the core; it contains more, but smaller, crystalline regions which are oriented round the fibre axis as well as parallel to it.

By varying the manufacturing process, the proportions of skin and core can be altered, until in some of the new stronger rayons, the core has disappeared completely. When this happens, the fibre coagulates as a whole, and so the cross-section is round (Fig. 4c). Other variations give rise to an asymmetrical skin (Fig. 4d), and this also gives a crimped fibre because of the difference in contraction and swelling of skin and core. Since the crimp is an inherent part of the fibre structure, it cannot be lost. Even where the fibres may be pulled straight during processing, they will curl up again on wetting. Fancy yarns can have various cross-sections, and one example of a very flat cross-section is shown in Fig. 4e. These special cross-sections are made easily only in coarse filaments. Ordinary rayon yarns are very regular along their length, but intentional variations may be introduced into fancy yarns such as the one shown in Fig. 5.

Table 3. Properties of Rayon.

	Regular	Medium tenacity	High tenacity	"Tenasco" Super 105
Tenacity, g./tex. ..	18	24	32	46
Breaking extension, %	22	15	12	10
Work of rupture, g./tex.	—	—	2·3	—
Elastic recovery from				
Half breaking load	0·34	0·36	0·38	—
Half breaking ext.	0·38	0·40	0·41	—
Wet strength / Dry strength ×100%	50	58	60	78
Density, g./c.c. ..		1·52		
Refractive index				
Light vibration II axis		1·55		
Light vibration I axis		1·52		
Electrical resistance at 65% r.h., ohm g./cm² ..		$1{\cdot}4\times10^{7}$		
Effect of sunlight	Loss of strength			
Attack by moths	Not attacked			
Attack by mildew	Attacked			
Effect of strong acids ..	Similar to cotton			
Effect of strong alkalis ..	Swelling and loss of strength			
Effect of organic solvents	Resistant			



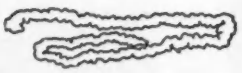


Fig. 4(e). Cross-section of 125 den. Du Pont No. 77 monofil rayon

(left) Fig. 4(d). Crimped "Fibro"

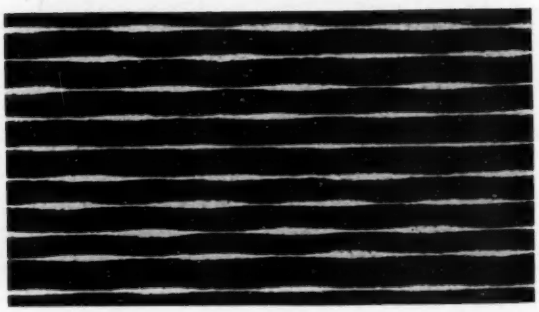
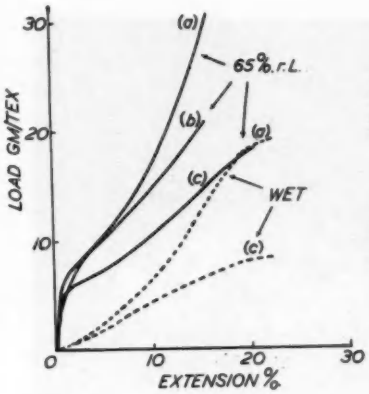
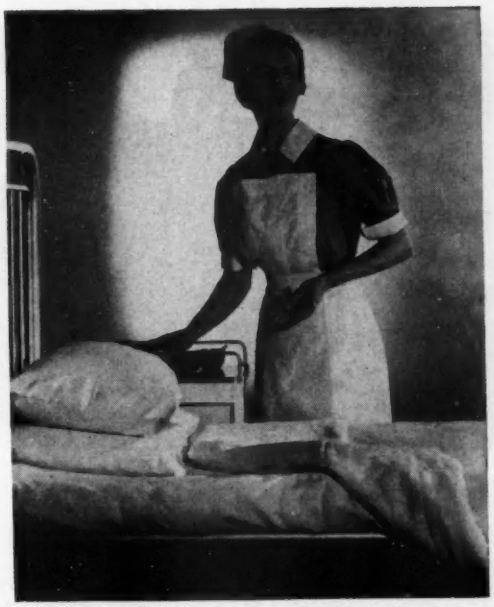


Fig. 5. Du Pont No. 50 and No. 60 thick and thin rayons



(left) Fig. 6. Load extension curves of rayons* (a) high tenacity Du Pont Super Cordura, (b) 3-den. staple fibre (C) 150-den. continuous filament



(right) Fig. 7(a). "Fibro"/cotton blends have proved highly successful for nurses' uniform. Mattress ticks and blankets are also made of "Fibro"

Properties

Because of the diversity in types of rayon, it is hardly possible to give a single list of properties, but some typical values are set out in Table 3. The early forms of rayon were weaker than cotton, especially when wet. The low wet strength of rayon is its biggest defect. However, by increasing the stretch imposed in spinning, stronger but less extensible forms of rayon were obtained: "Tenasco" is one example, and more extreme types, such as "Durafil," can also be made. More recently, improvements in the fibre structure have increased both strength and breaking extrusion. This has given the super rayons used in tyre cords: "Tenasco 35," "Tenasco Super 70," "Tenasco Super 105," etc. Similar advances in staple fibre production have led to "Strong Fibro" and "M55" and "M95" fibres. In all these fibres, the increase in wet strength has been proportionately greater than the increase in dry strength, so that rayon can now be as durable as cotton, even when wet.

The load-extension curves of various types of rayon are shown in Fig. 6. They show a strong initial resistance to extension, followed by a marked yield point, after which further extension is easier. Rayon absorbs twice as much water as cotton. Accompanying the moisture absorption, there is considerable swelling, both in cross-section and in length. This introduces dimensional instability into rayon fabrics—a factor which can be minimised by suitable finishes. Because of the regularity, and the corrugations running along their length, bright rayon filaments have a characteristic glitter. They can, however, be made dull by incorporating a delustrant such as titanium dioxide for example. The electrical resistance of rayon is comparatively low, and only in very dry conditions does trouble arise due to static. Nevertheless, as an absolute safeguard against sparks in the operating theatres of hospitals, a special form of rayon loaded with about 30% carbon black —which provides continuous conducting paths—has been made. Another form of rayon for medical use is loaded with barium sulphate to render it opaque to x-rays.

Uses of Rayon

At first, when it was an expensive fibre, rayon was used mainly in stocking manufacture, and became a competitor

Fig. 7(b) Surgical dressing from viscose yarn

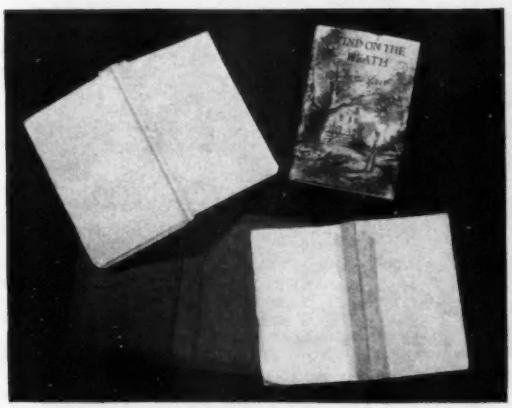


Fig. 7(c). Book bindings of bonded fibre fabric

Fig. 7(d). Heavy duty tyres reinforced with Courtauld's high tenacity rayon yarn on a Scammel cross-country vehicle

of silk, but it has now lost this valuable outlet to nylon. Rayon is now a cheap fibre and competes on price grounds everywhere. In some fabrics for example in worsted suitings, economy is the sole motive for its use, but in others the qualities of the fibre, especially of the newer types, justify it. Besides its extensive use in clothing and household goods, rayon has many industrial uses. Of these, the most important is in tyre cords, where rayon has now almost completely replaced cotton. The main potential competition to rayon in tyres now comes from nylon and steel. On technical grounds there is little to choose between rayon and nylon, except in aircraft tyres where the lighter construction of nylon tyres is a paramount advantage," but on cost rayon works out about 20% cheaper. Two new textile techniques consuming large amounts of rayon are non-woven fabrics and tufted carpets. In 100% rayon carpets crimped staple is the best, since it imparts bulk and resilience; but in blends with wool, either in tufted or conventional carpets, the round cross-section rayons—which soil less easily—may be used. The colour blending of spun-dyed fibres has been very useful in carpets.

Fig. 7(e). Blotter cover made from "Durasco," Courtauld's newest finishing fabric. Manufactured from spun-dyed viscose it is resin backed and has a new finish. Said to give exceptional wearing qualities

Fig. 7(f). Over 3 million tons of iron ore and limestone have been carried by this belt during 7 years' life at the Cargo Fleet Iron Works. It is reinforced with "Tenasco"

In general, the choice of the type of rayon depends on the application. For dress goods and furnishing fabrics, the more extensible forms are preferred. The improved varieties, such as strong "Fibro" and "M55" staple, are used where the extra cost can be justified—in terms of real economy to the user this should be almost always. For industrial uses, less extensible fibres are needed, and so "Tenasco" and its later improvements have been produced. The strongest and least extensible viscose rayons have not been widely used: "Fortisan," a regenerated cellulose made by the acetate process to be described in a later article, has been more successful. Some of the diverse uses of rayon are shown in Fig. 7.

Future Developments

Despite the intensity of 70 years' research, further developments in rayon will come from further improvements in quality, and the exploitation of the versatility of rayon. The production of steadily stronger rayons, which have been announced at intervals over the last six years, continues. All this stems from a better understanding and appreciation of the structure and formation of rayon. A new family of cross-linked cellulose fibres has recently been announced by Courtaulds (Alabama). Named "Corval" and "Tropel," they are reported to have (*a*) water absorption comparable with that of cotton, (*b*) better dimensional stability, (*c*) dry strength as great as rayon and (*d*) higher wet strength. Bright fibres, dull fibres, spun-dyed fibres, fine and coarse fibres, industrial yarns, fancy yarns, shirts, shoes, scarves, curtains, carpets, conveyor belts, hose-pipes, and a host of other textiles: all these are viscose rayon—a fibre of this century, with a still wider future.

Figs. 4(e) and 5 (courtesy E.I. du Pont de Nemours)
Other photographs (courtesy, Courtaulds Ltd.)

Suggestions for Further Reading

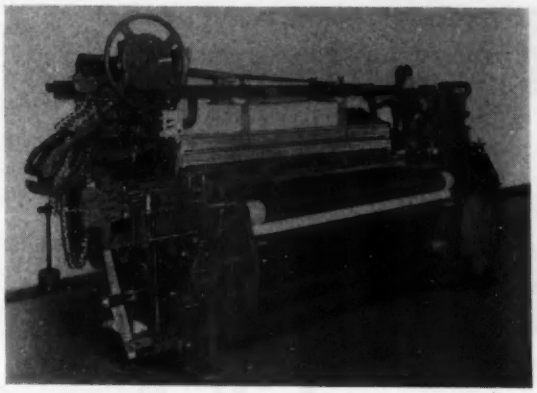
"Physics and Chemistry of Cellulose Fibres" (P. H. Hermans)—"Economies of Man-Made Fibres" (D. C. Hague)—"Man-Made Fibre Industry" (R. Robson).

Milan—International Textile Machinery Exhibition

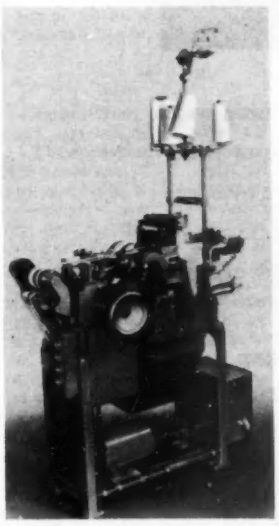
Further to the specialities shown at the exhibition which appeared in "T.M." (August, p. 361), the following machinery was also exhibited but was unavoidably left over from the previous issue

Four of their well-known high efficiency looms were shown by **Crompton and Knowles Corp., Worcester, Massachusetts, U.S.A.** The new C. and K. needle loom, for the production of both tapes and elastics up to 1¼ ins. maximum width, is a machine of modern design and each individual unit weaves two pieces of material simultaneously, side by side at the same level. Weft carriers, drawing yarn from cones, insert two picks in each shed which are locked in position by means of single knitting type needles. These machines are operating on a production basis in U.S. mills at speeds up to 1,400 sheds per minute on a wide variety of material.

The C-7A loom, introduced at Milan for the first time, is commonly referred to as the "push-button loom" because of the features incorporated in its driving and clutch mechanisms. The loom exhibited is of archless construction, without superstructure, 56 ins. between swords, with a maximum spread of warp in the reed of 50 ins. It will be operating at new high speeds and will be equipped with a 25 harness, $\frac{18}{32}$ in. gauge, cam-driven dobby in the low position. Twenty of these harnesses are for weave indication, while the remaining five are used to control the movement of the shuttle box. The lay motion will be almost entirely constructed of extruded aluminium alloy, reducing the overall weight of this assembly by approximately 60%.



Crompton and Knowles P.A.P.A. pick-and-pick automatic loom



Crompton and Knowles needle loom for tapes, etc., up to ½ in. width

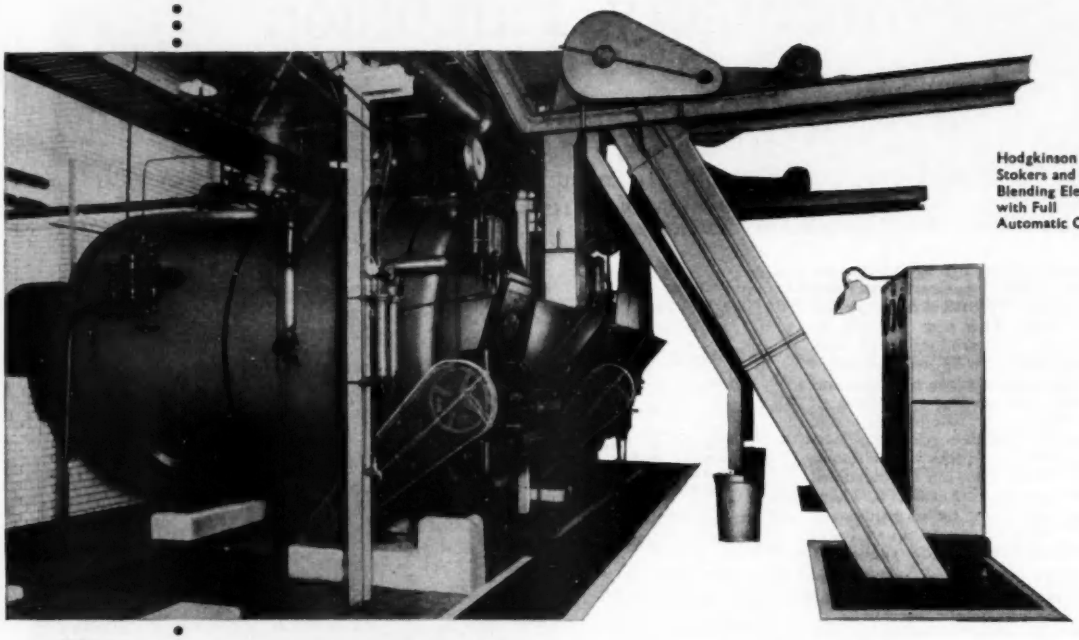
The popular pick-and-pick automatic loom is now available to the trade for the automatic bobbin changing production of a great majority of the fabrics previously been woven on non-automatic looms at slower speeds and lower work assignments. New and improved features on this model include vacuum weft control which will improve the quality of the cloth coming from the loom due to the virtual elimination of drag-ins, jerked-in weft, side lines, and so forth. The loom construction also includes new safeguards and conveniences which will make the work of both the weaver and the fixer easier.

Crompton and Knowles International Ltd. has concluded arrangements with Societa Nebiolo S.p.A., Torino, Italy for the construction of the W-3A line of looms. This arrangement is expected to result in an even wider distribution of this highly respected woollen, worsted, and spun rayon loom. The loom shown is a W-3A automatic bobbin changing all-purpose worsted loom, 82 ins. between swords, 25 harness, 4×1 - 4×2 - 4×4 box, and will be operating on worsted suiting at 130 p.p.m. Every effort has been made to equip the Italian-made W-3A loom with all of the latest features of the American construction. The improved A-girt loom frame with roller bearing crank and bottom shafts will be standard on all models produced in Italy. (Agents in the U.K. for C. and K. looms, etc., are A. E. Aspinall, Manchester.)

* * *

On the stand of **Siemens-Schuckertwerke, Berlin,** the fruits of intensive development and research were plainly seen. Of special significance was a torsion-resilient loom coupling, the result of five years' development and research. This comprised a resilient head easily mounted on the normal shaft extension of any loom motor. The force was transmitted from the motor shaft extension to the wall of the head via a helical spring. From there the driving force was transmitted by means of flat belts, V-belts or gears to the loom crank shaft. The highly-resilient spring had an initial tension corresponding to the average load. Due to the interposition of this spring severe load fluctuations arising during loom operation were not transmitted to the motor but merely caused a relative movement between the motor and the loom. Consequently, the motor ran at practically constant torque. The company stated that in the course of a great number of thorough practical tests it was shown that the use of this torsion-resilient loom coupling meant a reduction of 20% and more in the power consumption, at the same time increasing the number of picks by 1 to 2%. Siemens also showed a further development of their fully-fashioned

AUTOMATIC FUEL SAVING



Hodgkinson "Low Ram" Stokers and Fuel Blending Elevators with Full Automatic Control.

Full Automatic Control

FOR THE HODGKINSON "LOW RAM" STOKER

Full Automatic Control ensures efficient smokeless combustion with a wide variety of coal. Automatic adjustment of air supply to suit rate of firing maintains maximum CO_2 at a steady boiler pressure or temperature irrespective of load variations. A comprehensive control system with a wide turndown ratio can be installed with minimum alteration to both new and existing plants.

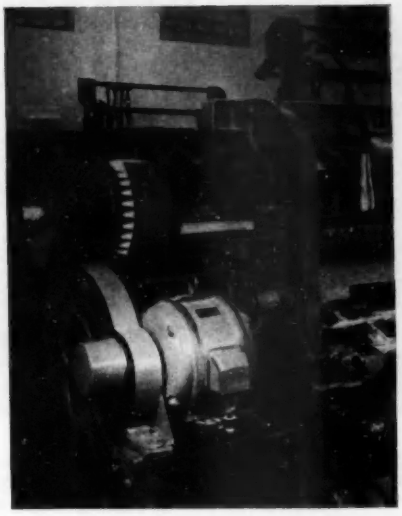
For lower operating costs, install Hodgkinson "Low Ram" Stokers with Full Automatic Control.

16 mm SOUND FILMS ON FREE LOAN "Running the 'Low Ram' Stoker", "Servicing the 'Low Ram' Stoker", "Combustion" and other titles, are available from the Hodgkinson Film Unit.

JAMES HODGKINSON (SALFORD) LTD

Ford Lane Works, Pendleton, Salford 6, Lancs. Tel: Pendleton 1491

Brettenham House, Lancaster Place, Strand, London, W.C.2. Tel: Covent Garden 2188.



Siemens torsion resilient loom coupling

Crowther "D" type warping machine

hosiery drives, an 8 kW d.c. drive with a speed control range of 1 : 30. The d.c. motor was fed from three-phase supply via transductors and silicon rectifiers.

A transistor-controlled d.c. motor, 22 kW, 580 r.p.m., demonstrates the potentialities of modern electronic engineering in the control of drives (transistor control). The motor is fed direct from the supply system via single-anode rectifiers and its direction of rotation can be reversed from full-speed clockwise to full-speed anti-clockwise within ½ second. With smaller variations in the speed the regulating time is so short that it can scarcely be perceived. In order to demonstrate the high quality of this control, the motor is coupled with an audio-frequency tachometer generator which makes the speeds audible over a loudspeaker. Those interested can adjust the speed so quickly on a keyboard located on a demonstration model that actual melodies in the range of 1½ octaves can be played.

• • •

A selection from the company's latest developments was exhibited by **Crowther Ltd., Thurmaston, Leicester.** The display included "B" and "C" type warping machines with electronic control, electro-magnetic braking, convenient push-button controls, low streamlined build, pre-determined yardage counter and pressure gauges. The "D" model, developed from the "B" and "C" model, is suitable for beams up to 84 ins. width according to requirements. However, its main use for which it has been standardised is for 54 ins. section warping. The machine is capable of warping beams up to 36 ins. flange diameter with speed up to 800 yds./min. The pressure roll can be applied to the beam at the pressure desired by a convenient adjusting switch and a pressure gauge. Pressure is applied hydraulically to ensure even beam density from beam to beam. In addition, the hydraulic system prevents the pressure roll bouncing. The hydraulic mechanism also works the mechanical loading and stopping of the beam, eliminating any physical effort.

Crowther truck type warper showing removal of a section

Included in the range of creels on view was the truck type. This was similar to the company's single end creel except that to save loss of time in replacing each package in the creel, each section (comprising a number of vertical rows) is on wheels and removable bodily. A reserve completed section is then wheeled in and fixed. Re-creeling time is appreciably reduced.

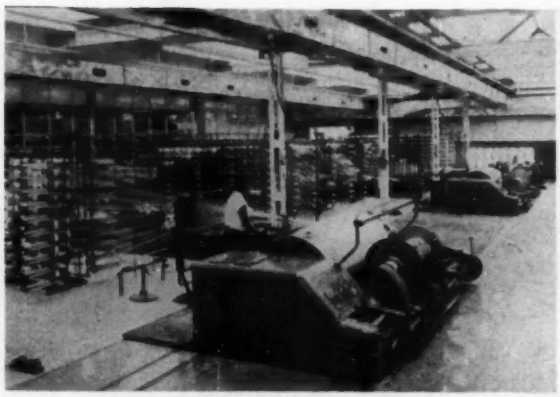
• • •

A considerable part of their well-known heald frames in the latest easily detachable form was displayed by **E. Froehlich Ltd., Muhlehorn, Switzerland.**

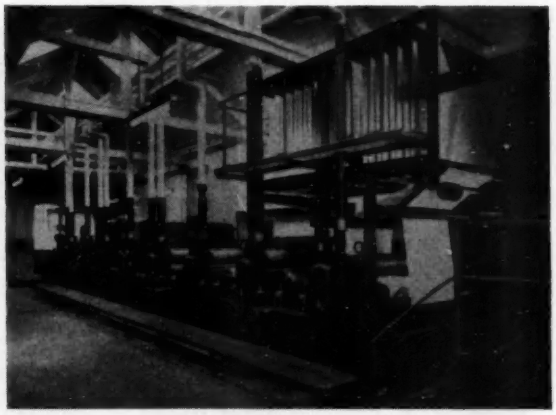
They showed for the first time the greatest part of their well-known heald frames in the latest easily detachable execution. The new connection between light metal supporting rods and steel side supports was extremely interesting. Due to their interchangeability frames of this kind may easily be detached or assembled even on the loom. Flat steel healds were also shown with a patented form of rectangular eyelets suitable for all different warp materials. Of special interest was the important show of leno equipment. The introduction of solid light metal frames into the leno business has been possible by protecting the light metal hollow profiles by a cover of plastic material. This protection of staves is all the more important in the case of leno frames, where only small dobby pitches and sometimes very wide frames are used. A new electrical warp stop motion with broken warp-end indicator on view was suitable for all different warp materials. (Sole agents for the U.K. and Eire, A. E. Aspinall Ltd., 16 Cumberland Street, Manchester 3.)

• • •

Froehlich detachable heald frames



The latest Benninger high efficiency warper in a cotton mill



Benninger open width continuous washing machine

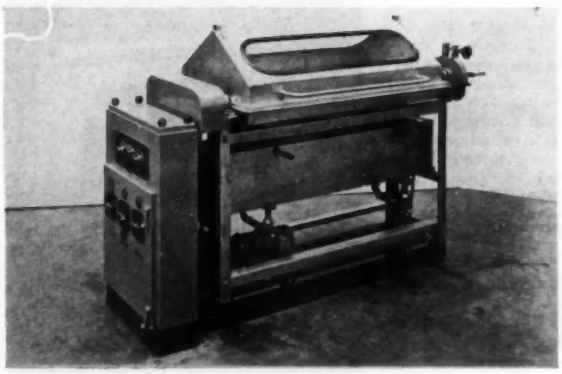
New designs of some of the company's specialities were shown by **Benninger Engineering Co. Ltd., Uzwil, Switzerland.** On the complete high-speed sectional warping plant, Type ZASe/GAA, the drum was completely enclosed and had a circumference of 2·75 yds. It was mounted on a carriage so that it could be laterally moved out of the machine. This permits the full drum to be brought in front of the slasher and, consequently, the beaming process can be omitted. Apart from well-known special devices, such as electric starter, drum reverse motion, variable reed headstock feed, automatic control of the guide reed, cone height determinator, automatic speed regulation for constant yarn tension, adjusted yardage counter etc., the machine was equipped with a novel leasing device. The creel was of completely new design and the new Benninger thread tension units attracted special attention since they have been built-up on a completely new system.

Finishing trade representatives were interested in a high-compartment of the Benninger open-width washing machine, Type LAA, a high temperature dye-jig and a 4-bowl laboratory padder were exhibited. The high-compartment, being completely closed, is particularly suitable for soaping processes. The built-in Turbinator was especially interesting. This mechanical device accelerates diffusion processes and is ideally suited for service in the soaping compartment. The new Benninger automatic high temperature dye-jig was equipped with a novel sampling device for accurate shading. (Agents in the U.K.—Barke Machinery Ltd., Ashton-u-Lyne.)

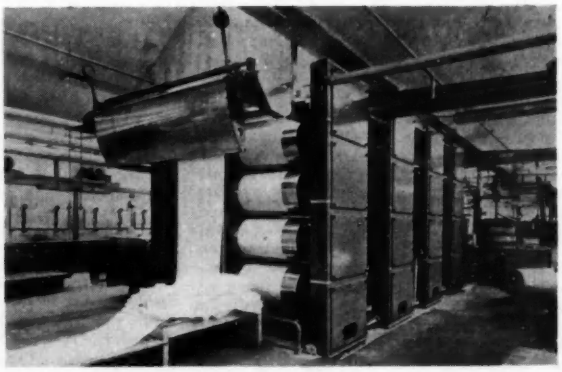
* * *

Tattersall and Holdsworth Globe Works and Stores, Enschede, Holland, displayed a drying machine with stainless steel cylinders equipped with patented "Relax" drive. Each cylinder was driven individually by an elastic drive. As soon as shrinkage occurred at a certain place the corresponding cylinder rotated automatically slower. The cloth rests tensionless on the cylinder making it possible to dry even the most tender fabrics, also rayon seersucker, acetate crepe, candlewick, repp fabrics, linings etc. Sturdily constructed, considerable attention has been given to the appearance of the machine and the power consumption is small. On the same stand was an automatic dye-jig for dyeing short sample lengths in the full widths. The recipes used on the small jig could be applied to large industrial jigs without difficulties because of the same liquid ratio. The electric heating was thermostatically controlled and a perforated steam coil has been provided for boiling purposes after dyeing.

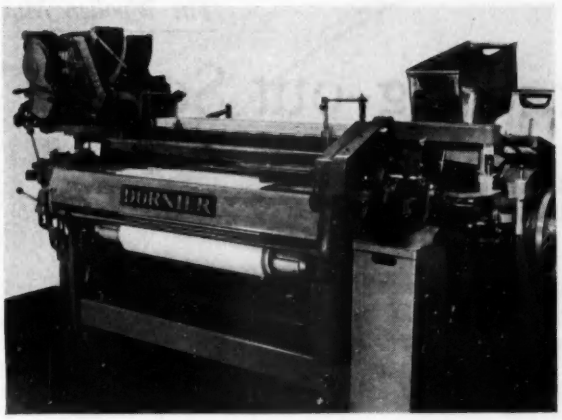
Two models of the "President" loom were exhibited by **S. A Metiers Automatiques "Picanol," Ypres, Belgium.** One was equipped with the "Unifil" winder and pirn changer and the other with the +GF+ box loader. On these looms, each shuttle-box has two tongues, one smaller swivelling-swell at the box entrance, lifting the daggers of the stop rod, the second, a twin spring contolled floating swell, gives a uniform shuttle braking action. The pick cam is made of cast steel with case-hardened nose. Both pick cams are located at the outside of the loom frame and easily accessible. Moreover, an adjustable concentric hub mounting and graduations on the flywheel provide means for accurate picking time adjustment. Most parts of the sley are made of light alloy of high tensile strength, specially designed to give true shuttle flight. The sley is moved by two spring loaded connecting rods, absorbing the shock when the loom bangs off due to a shuttle trap. The harness-frame has a top-suspension without top-rail. All tappets and treadle-rollers run on ball-bearings. By means of a special device the shed-opening can be adjusted even whilst the loom is running. All tappets are tempered. Treadle-rollers have ball-bearings. The tension on the reverse-spring motion is adjustable even with the loom running. Four different types of interior tappet-motions allow for



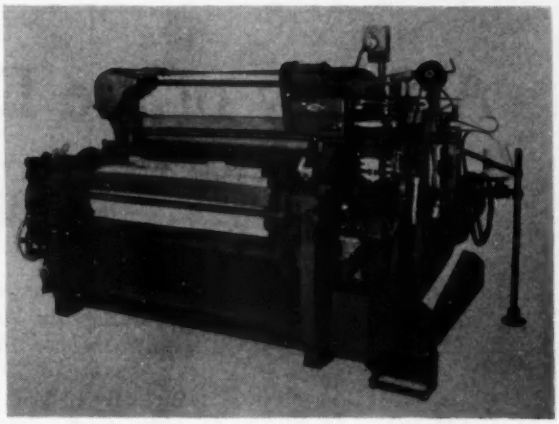
Tattersall and Holdsworth's automatic dye jig for dyeing short sample lengths



Cloth drying machine. (Tattersall and Holdsworth)



Fully automatic Dornier high-speed loom with +GF+ automatic feeding device A.L.V. and Grosse side dobby



Picanol "President" 48 in. reedspace high-speed automatic loom equipped with "Unifil" winder and pirn changer

the use of max. 2 - 4 - 6 or 8 shafts. Representatives in the U.K.—R. S. Maynard, Langham Court, Fielden Park, Manchester 20.

* * *

Lindauer Dornier Gesellschaft m.b.H. Lindau/Bodensee, Germany, exhibited a cross-section of their versatile manufacturing programme covering fully automatic looms and finishing machinery. The company's fully automatic high speed single shuttle and multi-shuttle looms are available with lateral cam dobby and lateral paper-card dobby. The designs of these precision-built machines provides all facilities for the transformation of one model into another. One model on view was equipped with the +GF+ automatic feeding device A L V for continuous weft filling from a pirn box. A modern high efficiency tentering system was on view. Special features were: (*a*) central operation and controlling system, (*b*) easy cleanable and interchangeable clips, (*c*) combined weft straightener in conjunction with the automatic controlling device "Orthomat" of Dr. Heinz Mahlo.

Trade Literature

SAMPLE CASES. A new booklet from Smith Sample Cases Ltd., Airport Works, Nacton Road, Ipswich, describes their individually designed representative's sample cases. These cases, with leather, leather-cloth, or vulcanised fibre exteriors, are specially designed to show the products to their best possible advantage and invariably, provision is made for the inclusion of catalogues and order book.

* * *

LIGHTING BY COURTNEY, POPE. All types, shapes and sizes of lighting media, from table lamps to luminous ceilings, are covered in a profusely illustrated 80-page brochure from Courtney, Pope (Electrical) Ltd., Amhurst Park Works, Tottenham, London, W.15. Section 1—Fluorescent fittings contains over thirty different types, whilst the tungsten type fittings are legion. Of particular interest are the Glolite, Flexigrid, Tracelite and Briteglo luminous ceiling lighting systems and application is shown.

* * *

DU PONT MAGAZINE. The usual range of interesting articles, showing some of the many and varied applications to which Du Pont products are put, goes to make up a recent edition of this bright house-organ, "Heyday for Hosiery" is the title of one article of interest to textiles. Using colour photographs the article illustrates several novel colour and pattern effects on nylon hosiery.

MORGAN CRUCIBLE CATALOGUES. Four new publications have recently been released by the Morgan Crucible Co. Ltd., Wandsworth Works, Point Pleasant, London, S.W.18. They are: Morganite Carbon Brushes, Morganite Unit Type Seals, Oil-Fired Basin Tilting Furnace, Type B.T. Mk II and Birlec-Morgan Electric Die-Casting Furnace. All are fully illustrated and set out their information in a readily assimilable fashion.

* * *

"TERYLENE" SAVES. Designed to serve as a reminder of the increase in "Terylene" usage in industry, an attractive, well illustrated new booklet is now available free of charge from I.C.I. Ltd., Imperial Chemical House, Millbank, London, S.W.1. Entitled '"Terylene" Saves," the booklet lists important properties of this well-known polyester fibre, describes savings made by "Terylene" in various aspects of industry and mentions some of it's recent developments.

* * *

TECHNICAL BOOKS FOR ENGINEERS. A comprehensive list of handbooks and reference works is contained in the Spring catalogue of the Machinery Publishing Co. Ltd., National House, 21 West Street, Brighton 1. Subjects dealt with, include Drawing, Design and Mechanisms, Foundry and Forging Practice, Hydraulics, and Sheet Metal Work. A special section on data sheets and charts is also inserted.

ELECTROLYTIC CONDUCTIVITY CELLS. A conductivity cell, connected to a suitable indicating instrument is used to measure the specific conductivities of electrolytes. The cell is designed to trap a precisely determined volume of the electrolyte between two electrical contacts of special construction, the spacing and area of which fix the electrical constant of the cell. Six different types of cell are illustrated and described in a useful booklet published by Electronic Switchgear (London) Ltd., Letchworth, Herts.

* * *

"FLOWRATOR" METER SCALING. A preliminary leaflet from Fischer and Porter Ltd., Salterbeck Trading Estate, Workington, announces the standardisation of "Flowrators" for variable-area flow meter scaling. Eight types of standard glass tube "Flowrators" are available, covering a wide range of high, medium, and low flows. These instruments have percentage scaled metering tubes and are supplied with either a factor tag or a clip-in metal scale to convert the percentage readings to flow values in the users required readings.

* * *

CROFTS' CATALOGUES. Eleven assorted leaflets and brochures have been received from Crofts (Engineers) Ltd., Thornbury, Bradford 3. They are: Emergency Slipping Devices, Magnetic Clutches and Brakes, Flexible and Resilient Couplings, Fabricated Steel Conveyor Pulleys, Stationary Field Magnetic Clutch, Motorised Conveyor Pulleys, and "Power Grip" Timing Belt Drives. The remaining four deal with various types of motors and reduction gears.

A Study of the Drawing-out Scroll (Part II)

The second of two articles which will undoubtedly assist the young spinning technician to understand and appreciate the significance of the drawing-out scroll

By J. A. B. MITCHELL*

THE speed of the scroll shaft can be altered independently of the rollers by changing either of two compounded wheels in the train of gears that transmit motion from the rim-shaft to rollers and scroll shaft. These drag change-wheels are shown as F and G in Fig. 5. The former, having 68 to 75 teeth, is a "driven" wheel, while the latter (on the outside) is a small "driver" change-wheel ranging from 13 to 15 teeth; either may be altered with equal facility.

Changes are seldom made in either of these wheels solely as a means of altering tension on the slubbings during the delivery period. Most spinners never like to make changes once a reasonable set-up has been established, but a properly trained spinning technician must know how and when to alter the speed of the scroll shaft independently of the rest of the mechanism, and at the same time be fully aware of the effects of changes when made. On occasion when an alteration is needed most spinners change G by one tooth, while finer adjustments in speed are made by altering F, say, two or even three teeth.

By changing the size of G from 13 to 14 the drawing-out scroll shaft is made to revolve one-third faster, but the roller speed is unaltered. Consequently the gain in speed of the carriage over the rollers applies greater tension on the slubbings during the pay-out. Incidentally, the additional effect of this change is to decrease the twist inserted while drafting during the remainder of the journey by reason of the higher speed of the carriage.

The converse is also true if the "driver" change-wheel G is reduced in size. Rarely does this wheel need changing when spinning the same, or almost similar, blends to standard counts by drafts which are kept fairly constant as in the manufacture of carpet and blanket yarns, but in spinning a wide range of weaving and knitting yarns, differing in fibre composition, counts and twist, the speed and setting of the scroll shaft require adjustment to suit the particular needs of the batch.

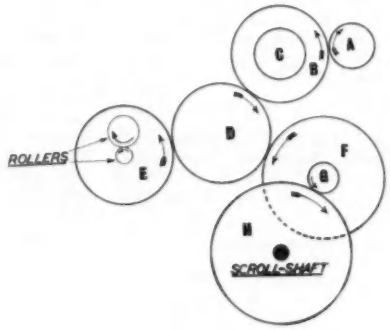


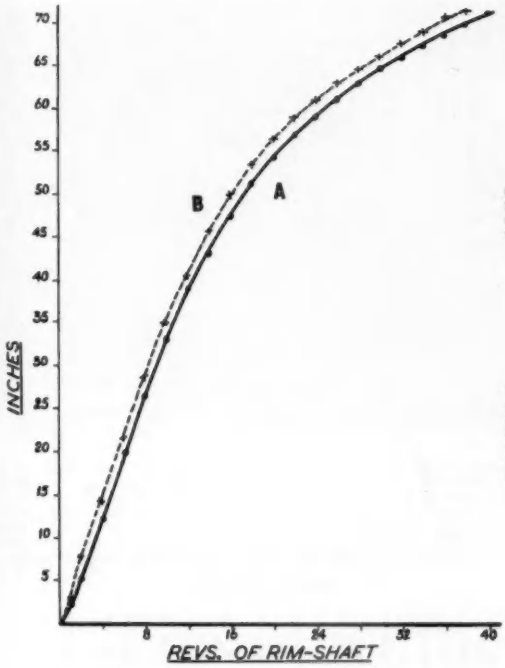
Fig. 5. Arrangement of gear train transmitting motion from rim-shaft to rollers and scroll shaft

Measurements of Carriage Movement

Fig. 6 shows graphs obtained, by methods already described, from measurements of carriage movement with two sizes of change-wheel G, viz, a 13 in A and 14 in B, but under the same setting of the scroll. It will be seen that the curve for carriage movement with a 14 drag change wheel lies above the corresponding one when the 13 is fitted, also that the two lines are more or less equidistant except at the start-up from rest. This is to be expected because the form of speed curve must remain the same since the setting of the scroll is unchanged, while the larger change-wheel merely drives the carriage proportionately faster on the outward journey and this is reflected in the plots being higher on the vertical scale of distance in relation to time. The use of a 15 wheel would merely repeat the curve in a position even above B but parallel to it.

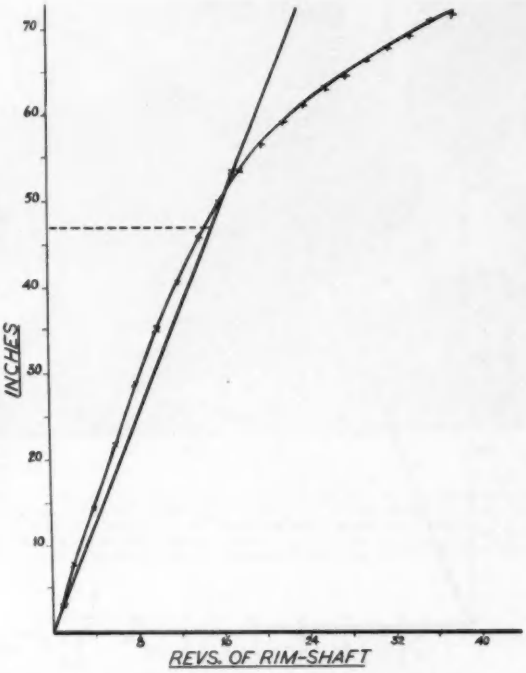
Figs. 7 and 8 show graphs A and B respectively when plotted separately (but on the same scale) against the straight line representing roller delivery under the practical conditions in force at the time these readings were made. In the case of Fig. 7 (13 c.w.) it will be seen that the carriage picks up speed quickly so as to draw level with the rollers before 15 ins. slubbing are paid out, the gain continuing to the point in the region of 45 ins. after which the speed of the carriage begins to drop. Incidentally the actual length of draw or delivery in this case is 47 ins., so that the drag imposed on the slubbings is fairly normal. There is just a hint of a slight dip in the ends before the rollers stop.

* *Scottish Woollen Technical College, Galashiels.*



(left) Fig. 6. Graphs from measurements of carriage movement with two sizes of change-wheel

(right) Fig. 7. Graph A in Fig. 6 plotted separately (but on the same scale) against the straight line representing roller delivery under practical conditions



Turning to the relationship established by a 14 change-wheel (Fig. 8) it is obvious that the carriage speed coincides with the flow of material from the rollers at the very start, but that it is too high throughout the entire period of delivery. In this instance there is no fear of the ends sagging, because at the finish of the delivery phase (47 ins.) the carriage is still overrunning the rollers. In fact the conditions of speed and setting of the scroll are such as would suit a longer delivery of, say 52 to 53 ins. While heavy slubbings of good fibre length would stand up to the treatment given by this rather extreme setting, there is every likelihood that irreparable damage would be caused to finer counts in the early stages of the run-out due to the pronounced drag imposed from the start by the faster moving carriage.

In order to counteract the gain in speed the scroll could be pulled round anti-clockwise in order to bring more of the back part into use and thereby commence winding-on of the rope from a lower diameter. By this change the carriage would move away from the rollers much slower than previously, then draw level with the roller speed and finally exceed it only after a short distance of the journey had been covered. As a result of this setting the strain would be removed from the ends at the critical stage of the run so that breaks and twitty places in the thread would be avoided.

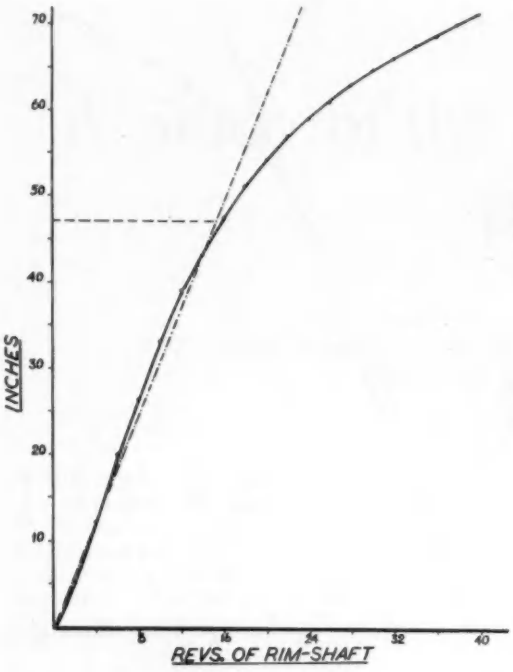
Sometimes the conditions of speed and setting shown in Fig. 8 are adopted as an effective means of pulling out snarls which tend to form in the thread at the moment of unlocking of the fallers, i.e. during the change-over from "winding" to "spinning." Snarls are usually the result of slack winding, particularly at the nose of the cop, and they appear in the length of thread coiling round the blade as well as in the portion bridging the gap between spindle and rollers before the new draw commences. Otherwise this setting of the scroll is obviously best suited to a slower speed of carriage such as would result from the use of a 13 c.w.

Different Settings

Consider now the effects of different settings of the scroll under conditions of a fixed speed. Fig. 9 shows two graphs constructed from measurements of carriage speed with the scroll in two positions, but using a 13 c.w. in each case. Graph 1 is from a typical setting, in which 3 or 4 ins. of the back part are in use while for graph 2 the scroll has been turned round so as to throw the back part out of action and commence the run from the top of the spiral track, i.e. at the point marked 3 in Fig. 1 ("T.M.," July, 1959).

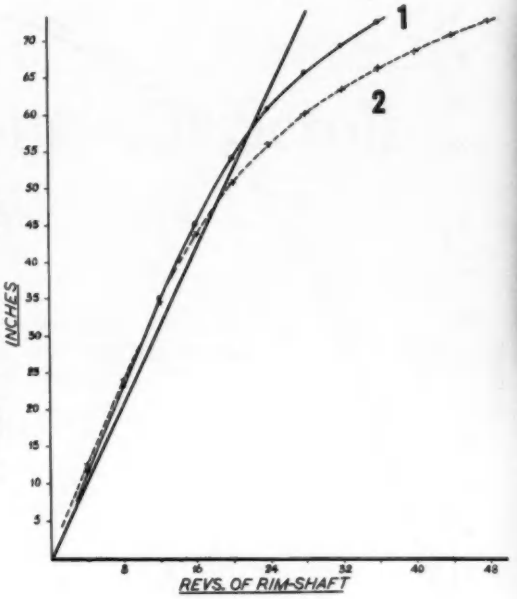
It will be observed that the curves lie pretty close to one another for the first half of the outward run, that the plots in 2 are just slightly above those for setting 1 during the early part of the journey, but after the halfway stage the lines diverge and reach the limit of the stretch (72 ins.) in widely different periods of time, viz. 36 revs. in 1 and 48 revs. of the rim-shaft in 2. When the scroll is set to start from the highest point of the track it also means that more of the nose or narrow part will be in use. As a result, the fall in speed of the carriage comes on early and continues progressively to the limit of the stretch. According to the delivery rate recorded at the time either of these settings would be suitable at the start of the run-out, e.g. on the first 10 ins. or so, but beyond this point the carriage gains little by little on the rollers so that under actual spinning conditions there would obviously be no sag in the ends up to the limit of a 50 ins. delivery for setting 2, and even for as much as 56 ins. in setting 1.

It is important to realise that the continued gain in speed of carriage over rollers has no significance after the latter stop delivering because, beyond that point each curve merely shows the extent of the drop in carriage speed and the position on the horizontal axis of the graph at which the end of the outward journey is reached. Alternatively the extent and shape of the curve is almost an inversion of the one which plots the steady concentration of twist in the thread as the draft proceeds to the limit of the 72 ins. stretch.



(left) Fig. 8. Graph B in Fig. 6 plotted separately against the straight representing roller delivery

(right) Fig. 9. Two graphs constructed from measurements of carriage speed with the scroll in two positions



Which setting would be better, or even if either would be suitable, for a given blend, draft and count, cannot be deduced from an inspection of the two graphs. Yet it is of value in studying the effect of the scroll setting to appreciate just how the drawing twist would build up under certain conditions of spindle speed (slow phase) and length of slubbing delivered. Assume for this purpose that a 14 ins. diameter rim is used with each setting, then the turns per inch during the entire period of drafting would rise as shown in Table 2. It will be noticed that by a change of setting there is a difference of 1·0 t.p.i. in the supporting twist at the moment when the draft finishes. This is a large difference considering that with either setting of the scroll the actual attenuation begins with almost identical amounts of twist, viz. 2·1 t.p.i.

It must be remembered, of course, that in practice the conditions imposed by setting 2 are hardly likely to fit the needs of the same blend, spindle speed, draft, etc., as completely as, say setting 1 might do. However, beyond pointing out that the slubbings might be subjected to rather more tension than is advisable or safe in a normal delivery of 47 ins., more particularly in setting 2 than in setting 1, especially after the carriage has covered the first 10 ins., it is unwise to read any more into the merits of either setting in the absence of a full knowledge of the material being spun and the draft, etc., required in the spinning process. Nevertheless, it is hoped these two articles might assist the young spinning technician to appreciate and understand the significance of the drawing-out scroll, the effects of changes in speed and/or setting, and at the same time fill a void in the scant literature available meantime on the subject of woollen mule spinning.

Table 2

Revs. of Rim-shaft	Turns/ins. Drawing Twist Setting 1	Setting 2
16	2·1	2·15
20	2·2	2·32
24	2·34	2·52
28	2·5	2·75
32	2·73	3·0
36	2·9	3·2
40	—	3·45
44	—	3·7
48	—	3·9

Synthetic Resin Finish for Drip/Dry Effects

Calaroc EU, a resin finishing agent recently introduced by I.C.I. Dyestuffs Division is a stable solution of dimethylol ethylene urea in water, applied by the established technique used in resin finishing, i.e., by padding, drying, curing and washing-off. When Calaroc EU-treated cellulosic fabrics are cured, the fibre reacts with the resin precondensate, with a resulting marked reduction in its swelling in the presence of water. Calaroc EU is amenable to the inclusion of other agents in the finishing bath. In Auxiliary Products Pamphlet No. 109 the makers give full details of its properties and use. Additional data are given in Technical Information No. 499 from I.C.I. Dyestuffs Division, Blackley, Manchester.

Wear Resistant Features in Gate Tension

RECENTLY developed by Crabtree Textile Accessories Ltd., Stonebridge Works, Colne, the new type of gate tension shown has Sintox hard ceramic working surfaces which, it is claimed eliminate the problem of wear. The gate sides will practically fit all types of brackets; they can also be purchased separately to replace metal sides which have been cut. As it passes through the device the yarn is prevented from escaping by the flanges with which each small roller is equipped. The tension can be supplied by weights but, for those machines fitted with a compensating lever, a suitable hole is incorporated. Further information will be gladly supplied by the manufacturers.

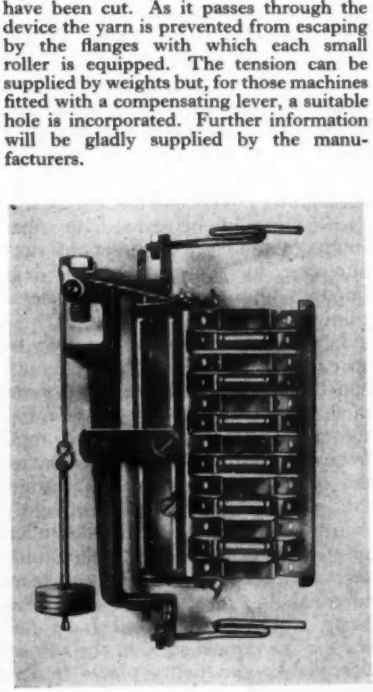


Fig. 1. This view shows a corner of the machine shop where some of the larger tools are situated. The lathes used in this shop are a 24-in. × 16-ft. lathe, a 14-in. × 6-ft. selective head quick change lathe, a 24-in. × 15-ft. double-backed geared quick change lathe, and an 18-in. × 54-in. heavy duty all-purpose lathe. The picture also shows the Cincinnati 10-in. × 52-in. milling machine and an Aster pipe threading machine and a pedestal floor grinder. This picture also shows the floor which is daily cleaned by brushing and which is buffed with steel wool about every two weeks

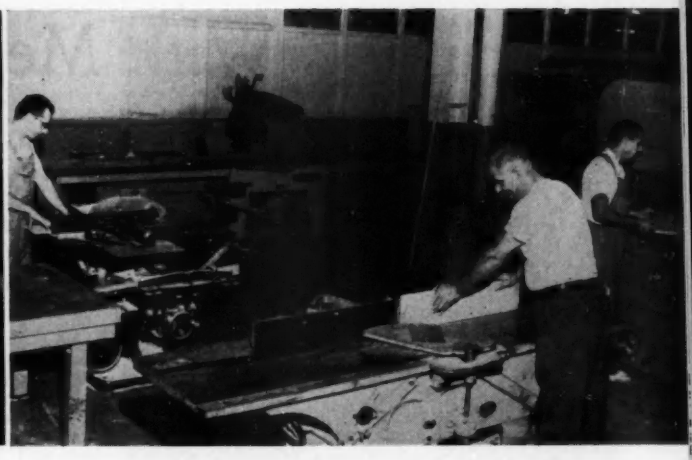


Fig. 2. This shows the carpenter shop machines which are situated in a corner of the machine shop. There is a 12-in. planer, a 20-in. band saw, a 20-in. swing saw, a Universal wood working machine, a 16-in. rip saw, a 16-in. knife hand jointer and an 8-in. circular saw. Against the wall is a rack used for the storage of the most usable kinds of timber

The Machine Shop—a Vital Link in Textile Maintenance (I)

By J. V. PHILLIPS

SOME mills mistakenly consider their maintenance department as non-productive. Although it may not run on a piece-rate or incentive system it should, nevertheless, produce effectively for every available man-hour.

The maintenance department can consist of many sections, the most important being the machine shop, which should be established and operated so that it can provide with minimum cost, a service to all manufacturing departments. This applies whether there is a centrally situated machine shop or several smaller ones scattered throughout the entire works.

The siting of the machine shop is a vital factor if it is to operate at the lowest possible cost. There are mills where the machine shop is, unfortunately, located in the basement of a building because this area is not being used for production purposes. Similarly, some machine shops are in out-of-the-way buildings where it is inconvenient for maintenance staffs to perform efficiently their tasks.

Today's modern mill should regard the machine shop a key department and try to locate the maintenance department centrally to other departments. Good lighting and ventilation are essential, also modern machine tools so that repair work can be carried out with the greatest precision. Stocks of timber, steel, and sheet metal should be given a place in a corner of the shop, or as near to it as possible. Mill supplies should also be located near the machine shop to minimise the travelling time entailed in mechanics and assistants obtaining materials.

Another aspect of machine shop work often overlooked is that the greatest percentage of work is not repairs but additions, improvements and alterations to production equipment. A well-equipped machine shop should have floor space available so that new machines can be built before going into production lines for processing and production of yarns and fabrics.

Since the war labour and material costs have increased rapidly and the effect of machine shop costs on mill profits cannot be lightly ignored. Materials must not be wasted and the mechanics' time planned to the greatest advantage. At one time the maintenance might have been regarded as a jack-of-all-trades but under the present competitive conditions he has become a well-trained operative with wide experience of all machine tools; he must be skilled to produce high precision machine work at minimum cost. Another reason for the change in machine shop personnel is that modern textile machines are precision built to fine limits so that better yarns and fabrics can be produced with higher production speeds. Much machine shop work is now done with extremely close tolerances and press fits. Farseeing mill management fully realises the importance of machine shop costs and it is essential to carefully analyse machine shop costs because in many cases it comprises a substantial proportion of the cost of the mill maintenance costs. In the past few years maintenance costs in certain instances have amounted to as much as 3% of net sales which shows only too well how efficient and inexpensive maintenance must be to fit into this picture.

As an example, consider a modern mill where the machine shop is situated on the ground floor of one of the main factory buildings where there is a large amount of window providing excellent outdoor lighting and ventilation. This machine shop arranged to give good access to other main buildings also includes a group of woodworking machines and the floor area given over to the whole shop is approximately 10,000 sq. ft. Next to the shop is a tool room where cutters, dies, small tools and other items used by the maintenance personnel are kept. These are neatly stored according to size and type in divided drawers, cabinets and open racks. The tool room is the responsibility of one man who keeps a record of everything issued or taken out by the mechanics. He must also ensure that all tools are returned in good condition and stored in their proper place. Next to the tool room is the mill supply stock room where the machinists, carpenters and other craftsmen obtain supply parts necessary for their jobs, i.e. small castings, gears, etc. This proximity to the machine shop eliminates the lost time of the mechanics which so many times is one of the hidden costs in the performance of maintenance work.

Another very important advantage in having the machine shop centrally situated and the carpenter's shop, paint shop and others situated close by is the close and effective supervision that can be given by the shop foreman. He can at all times watch the work.

Printing With Metallic Powders

Because they are different from conventional dyes and pigments, these powders require modifications in colour printing processes if good results are to be expected

By M. MACKAY

BRIGHT, sharp patterns can be printed with metallic powders if the usual procedure is modified to suit the peculiarities of these materials. Cloth preparation is generally the same as for any other style of printing, but some plants calender the fabric before printing in order to present a flatter surface that will retard penetration of the metallic particles. On flannels, it has been found beneficial to use a schreiner calender to flatten the nap. This operation retards absorption of the binder before it can be cured and contributes to well-fixed surface effects.

Binder Selection is Critical

Binders for metallic powders are all based on resins cured to fix the metallic component on the fabric. Binders include mixtures of ethyl cellulose as a carrier, a melamine resin to improve washfastness, and an acrylic resin. These binders are used with varying success according to the skill of the plant chemist. It is safer to use a proprietary non-solvent binder designed for the purpose. The ideal binder dries fairly quickly but not so fast as to cause the metallic mix to dry on the print roller and clog up the engraving.

Water-in-oil binders are generally satisfactory; but if oil-in-water pigments are printed ahead of them, there is some danger that the water-in-oil emulsion will be broken by contamination from the oil-in-water mixes. Further, water-in-oil binders will not fix the metallic powder in areas where they fall on oil-in-water pigment prints. Oil-in-water binders are very good, but do not have the printing qualities of non-solvent types. They are more difficult to lubricate and tend to streak and stick to the print roller. Lacquer-type binders present a fire hazard in roller printing but are satisfactory for screen printers.

Right Particle Size

The most satisfactory mesh sizes of the metallic powders will pass through screens of 285 to 325 meshes/in. Smaller particles do not bind well, and larger ones have inferior light-reflecting qualities. The metallic powder should be supplied with a non-tarnishing coating by the manufacturer.

The metallic powder should be mixed with the printing medium with a hand paddle. If the binder needs thinning, the manufacturer's directions should be followed closely. Excess solvent or water may affect the binding quality of the mix. Oil-in-water binders may be lubricated by addition of small amounts of a synthetic detergent such as Igepal or Triton X-100. Water-in-oil binders usually require no added lubricant.

Small Mixes

It is good practice to mix only enough metallic-print formulas to last 2 to 3 hours. Any mix left overnight can be worked up again on a basis of 1 part old to 10 parts fresh material. The print rollers used to print metallic designs should have coarse grounds etched down to the point where they resemble the teeth of a file in the bottom of the engraving. Too-fine grounds tend to clog with metallic particles. Unbroken lines around the roller that are too fine to be ground should be avoided because any foreign matter trapped under the doctor blade will strip colour out of the engraving and the line will not print.

Straight copper rollers give better coverage than chromium-plated rollers, and metallic powders do not scratch the copper; the copper surface also appears to give better adhesion of colour. Because of the deep engraving and shallow grounds, rollers prepared for metallic printing are seldom suitable for other types of printing media.

Light Set Important

The roller used to print a metallic pattern should be set lightly against the fabric. Heavy pressure drives the binder into the fabric and leaves the metallic component on the surface with insufficient binder to hold it. To prevent other colours in the pattern contaminating the metallic print, many printers use a gum roller ahead of the metallic-print roller, also a lint doctor on the metallic-printing roller. Metallic prints that fall on alkaline colours may be tarnished by the alkali and metallic prints on colours made alkaline with ammonia are almost sure to tarnish.

Drying and Soaping

Metallic prints should be dried in such a way as to avoid contact of the face of the goods with hot metal until nearly dry. This can be achieved with flue dryers or infra-red units or, at least in part, by wrapping the first few cans in a stack with back grey. Cloth wrappings should be watched and the outer layers should be cut off as they become contaminated. Acid ageing that may be required for other colours in the pattern is sufficient to set the binder of the metallic component; for superior fastness, a curing operation at 300°F. for 2 mins. is recommended.

Before the prints are soaped, some printers calender the goods to flatten the print and get a better reflective surface. Prints acid-aged should be soaped within 8 to 12 hrs. to avoid tarnishing by the acetic acid used in the ageing process. The acid may cause tarnishing after long exposure even when protective coatings have been applied to the metallic powders by the manufacturer. Finally, the pH of the soaping bath should be checked frequently to be sure that acetic acid has not built-up in the bath in excess. Traces of acetic acid left in goods eventually causes tarnishing.

High Quality Woven and Printed Furnishings

The beautiful cloths on the facing page are a selection from the remarkable range of textured weaves and prints manufactured by Crest Weaving Co. Ltd., 112 - 114 Hilltown, Dundee. All are cotton and 48 ins. wide, except No. 4; this is a pure linen fabric, 50 ins. wide. Brief details are as follows:—

(1) "Raindrop." A distinctive textured weave achieved by subtle combination of black knop yarns and white slub yarns.

(2) "Mexico." Incorporating a newly developed cotton slub yarn, this original design by Rodier Miller, is in sharp relief—in white—on a two-tone brownish-green ground.

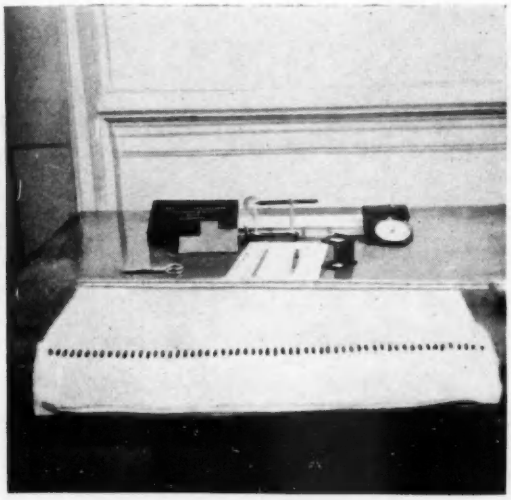
(3) "Tropical." By the same designer—and showing the same originality as in No. 2—this double-toned green and white design also includes a new slub yarn.

(4) "Kentra." A novelty woven textured weave in 100% linen and finished with a non-shrink treatment. Two shades of green give a subdued lustrous appearance.

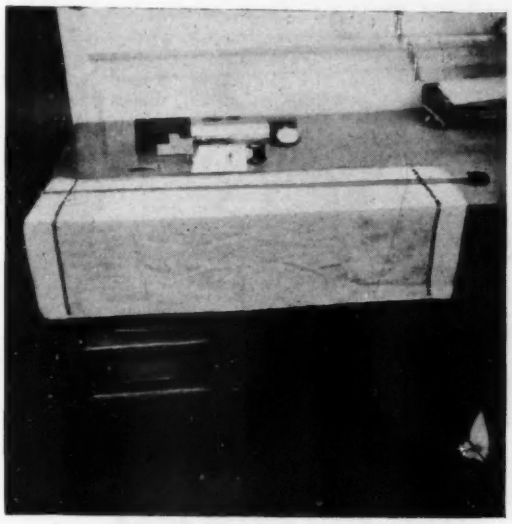
(5) "Glade." A beautiful print, circled in white, making full use of a neutral grey ground.

(6) "Cherokee." Another textured weave emphasing the maximum effect in weave, design and colour blend. Royal blue fancy folded weft with a black warp.

(7) "Roses." Clean, bold lines and lovely pastel shades in lime, gold and lilac make this attractive print.



(left) Essentials in terry analysis—tape measure, scissors, counting glass, template, yarn balance, pocket calculator, particulars sheet and the sample for testing



(right) When measuring a towel for length and width it must be laid perfectly flat on the table

How to Analyse Terry Fabrics

Correct analysis is determined solely by logical step-by-step methods in which every particular is noted and checked. This involves much more than the usual count of ends and picks, weight, length, width, yarn counts, etc.

By T. HARGREAVES

THOROUGH fabric analysis is always a painstaking task at the best of times and, if the fabric is a towel or one of the many types of terry fabrics, the job becomes more complicated by the presence of a "third dimension," i.e., the terry loops which may be bleached or dyed and equally spaced and woven on each face of the fabric, or in patterns of alternating colours or blocks of terry loops. In contrast, cloths which are woven substantially in a flat state, may be referred to as "two dimensional" in that they contain only warp and weft threads whereas a terry fabric has both these, in addition to another beam (the top one) containing the pile yarns. This "third dimension" consisting of the terry loops is extremely important for several reasons. For example, if analysis of a sample which is subsequently woven reveals that the height or number of these loops does not correspond faithfully with those in the sample, any or all of the following adverse factors will operate:—

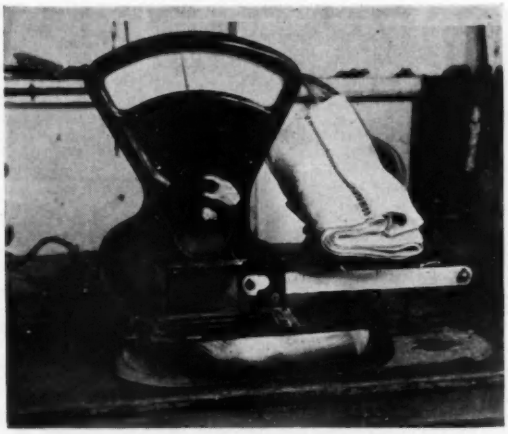
(1) The weight of the fabric will be wrong.
(2) Appearance and handle will also be different.
(3) The costing will be in error.
(4) The manufacturer may suffer either a substantial monetary loss or total rejection of the goods.

It is quite customary in this specialised section of the trade to receive from national or local government institutions, or large stores—all of whom may pride themselves on the efficiency of their testing methods—a printed data sheet setting our specifications to be met by the manufacturer, and from this data the manufacturer is asked to quote a price. Often, however, these specifications will ignore the true relationship that the third dimension (the terry loop) has to the structure and stipulated weight of the particular terry cloth for which a quotation is invited.

Incomplete information has its serious implications in that, it is possible to deviate from the printed specifications and yet have the width, length, weight, strength, and other particulars correct in every detail. In view of this, it is extremely important that purchasing executives should ensure that a sample, full-sized, unlaundered terry towel, or piece of the fabric is sent in addition to the printed specifications to the company invited to quote. Permission should also always be given to the firm to cut and unpick the sample if necessary, in order to obtain a true picture of the fabric particulars. Failure to recognise these simple but sensible precautions may result in a fabric construction being mis-interpreted and resulting in a manufacturing price which may give either insufficient or excessive margins.

Terry fabric samples submitted by civilian, governmental, or institutional sources for which tenders are invited, demand exceptionally careful analysis in order that the costing department can accurately assess true prices so that the weaving department, equipped with correct particulars, will produce the right cloths. If the weight of the finished fabric is heavier than the prescribed weight, the buyer will hardly ever complain. It is also extremely unlikely that he will voluntarily increase his price to pay for the excess weight. The loss created is the manufacturers worry for which he must accept full responsibility.

On the other hand if the weight of the fabric is lighter than that pre-



(left) Weighing sample towel to check against calculated weight

(right) A stripped down 1¼ × 1¼ ins. piece of terry fabric is utilised to find details of the ends and picks, single or folded yarns, etc.

scribed, or fails to meet some other requirement, the manufacturer will invariably receive oral and written complaints followed possibly by a compensation claim or insistence on a lower price; in some cases total rejection of the goods may occur. The manner in which a sample terry towel is analysed can best be illustrated by following a systematic step-by-step method of reasoning and examination such as outlined in the following example:—

(1) The towel is a bleached but undyed specimen.
(2) Its appearance confirms that the bleaching was done after weaving, i.e., the towel was woven from natural grey yarns, then bleached in piece form.
(3) Assume the specification allows a moisture content regain of 5% from the bone-dry state.
(4) The towel is an all cotton yarn construction.

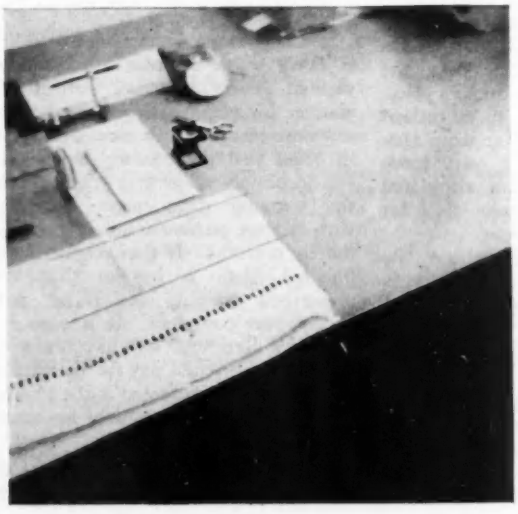
Analysis of the cloth is undoubtedly performed more quickly if the job is done in a logical sequence. In the first place width and length must be ascertained, making allowances for sewn hems, if any. Next the towel should be placed in a drying oven to find the bone-dry weight. To this is added 5% or whatever regain is allowed in order to arrive at the normal conditioned weight of the sample. Afterwards it is advisable to check with the specifications that width, length and normal condition weight agree with the findings. If these deviate from very slight tolerances, it is better to obtain and test another sample. If the foregoing particulars have been accurately assessed, the rest of the analysis can be dealt with.

Proceed to remove the pile warp ends, from both sides of the towel to form a 1¼ ins. square. This exposes the "two dimensional" ground weave of the towel, i.e., the finer ground warp and the interweaving weft. Having done this, the exposed portion is examined to determine:—

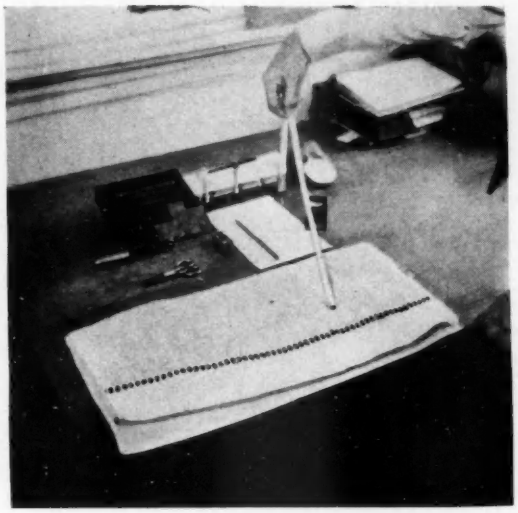
(1) The type of ground weave employed. Weaves other than 3-pick terry are sometimes used.
(2) The reeding plan, whether it is 1 pile 1 ground per dent or 2 pile ends in one dent and 2 ground ends in the next dent, or any variation from this.
(3) Whether single or double loop construction is used. In single loop construction there are an equal number of pile ends to the ground ends (omitting selvedges). In double loop construction 2 pile ends are used for each ground thread.
(4) The exact number of ground ends per inch.
(5) The exact picks per inch in the terry portion of the fabric.

The number of ground ends in the towel is then calculated by multiplying the ends per inch by the inches across the width (excluding selvedges). To this is added the number of ground threads in each selvedge to give the total ends in the ground warp. If single pile construction is being dealt with the total ends in the pile warp will be equal to the number of ground warp-ends as already found, but if double pile construction has been employed, the number of pile ends is doubled.

The towel is next laid flat on a table and a distance of, say 4 ins. lengthwise of the cloth is measured and marked. At both ends of this 4 ins., the pile yarns are cut with a small pair of sharp scissors. From this 4 ins. portion several of the terry threads are successively drawn out and, exercising care,



Needles 4 ins. apart are inserted under the two rows of terry loops. At these points some of the pile yarns are cut, carefully drawn out and accurately measured to find the terry/ground ratio



An alternative method of measuring an extracted pile yarn to determine the terry/ground ratio

these are measured to find the length when straightened *but not stretched*.

$$\text{Ratio of pile to ground} = \frac{\text{Average length in ins.}}{\text{4 ins. of woven ground}}$$

$$\text{e.g. } \frac{20}{4} = 5:1$$

Many types of towels are woven with bands of non-terry fabric at each end, mainly for decorative purposes. These are known as "headings" and, in addition, some towels have bands of non-terry fabric in the body, again mainly for decorative purposes. In these cases, the total length of the terry portions of the fabric—in inches—in one towel must be correctly found. Similarly, the total lengths of non-terry woven portions of the fabric—in inches—in one towel should be ascertained (including any lengths that may be in sewn hems). Further the total length of fringe—if any—at each end of the towel should be included. The totals of these three should actually equal the cut length of the bleached towel before any of the hems are sewn.

When non-terry portions of the fabric are woven it is sometimes advisable to insert more picks than in the terry portions of the towel. Careful examination under the pick counting glass will soon reveal if the sample has extra picks in the non-terry portions. These extra picks are more important than ever in these days of keen competition. It has always been the practice to momentarily retard the take-up motion when changing from non-terry to terry weave to avoid unsightly "cracks" or thin places across the width. Usually 4 to 6 extra picks are inserted in the cloth at each end of these changes, and this is known as "cramming."

Total ins. of terry portions X p.p.i. when weaving terry .. ..
Total ins. of non-terry portions X p.p.i. when weaving non-terry
Total number of changes from non-terry to terry weaving X6
Total picks in one towel ..

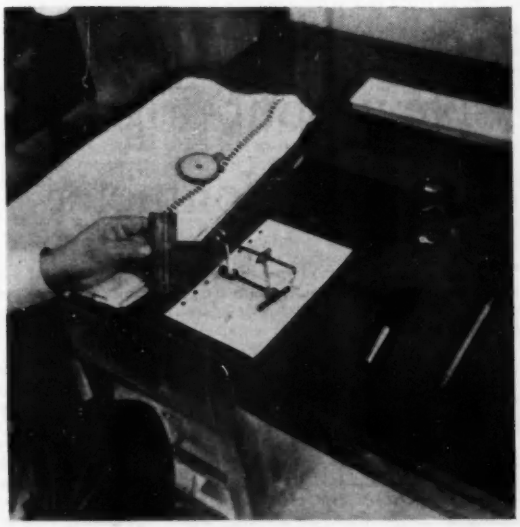
Total Picks in One Towel

It is extremely important to note whether any other types of weft yarn have been used in the headings and, if so, the counts and colour. Again one must find how many inches of fringe there are in one towel and, although not using weft, the amount of pick time these absorb in weaving. Full information on the type and counts of yarn in the towel must be extracted from the sample. To do this (if not stated in the specifications) the best plan is to take out a number of threads cut to length by a template and, by some appropriate method, decide the counts and note whether single or folded yarn is being used, and set out as follows:—

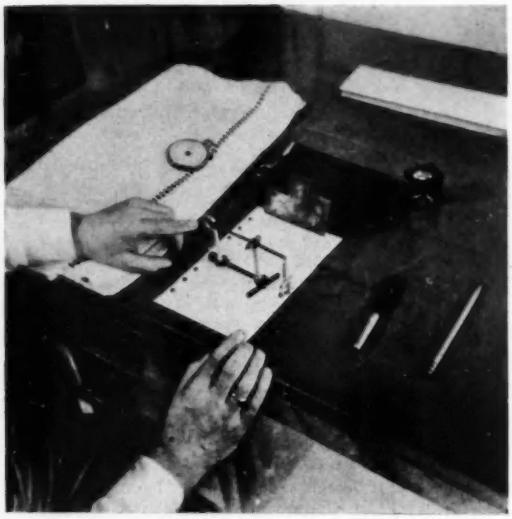
(1) Counts and type of ground (if 2 ply—the t.p.i.).
(2) Counts and type of selvedge ends (if different from ground).
(3) Counts and type of pile (if 2 ply—the t.p.i.).
(4) Counts and type of weft (bleached and/or coloured).
(5) Counts and type of any special heading yarns.

Yarns tested after bleaching usually show about one count finer than the grey yarn used to weave the towel. The towel noted in the first examination was "a bleached specimen—but bleached after having been woven." This, of course, implies that shrinkage in width and length probably occurred from the loom state dimensions to the bleached finish dimensions, also a loss of weight due to bleaching. The next factors to ascertain, therefore, are (*a*) the original loom state woven cloth width, (*b*) original loom state length when cut before hem sewing, and (*c*) original loom state weight of grey yarns in one towel before any loss due to bleaching.

The buyer is only concerned with the finished bleached towel, the width, length, weight and appearance at this stage and, conversely, the manufacturer is chiefly concerned with the width, length, and weight as originally woven, so that when finished it will match the bleached sample. Moreover, he must know this loom state grey weight in order to find the yarn costs. The loom state grey weights plus the waste loss from spinning to

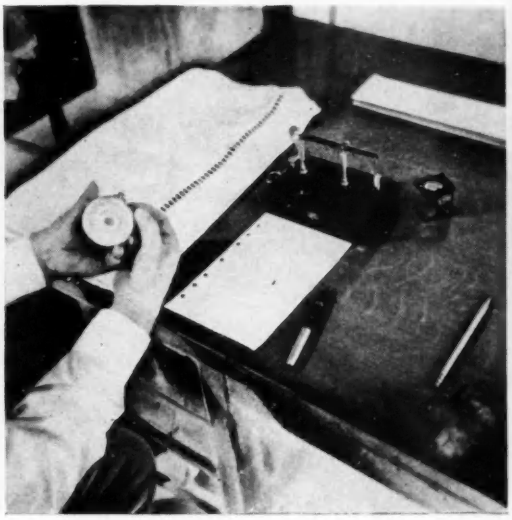


The template employed in measuring the threads to cut to place on the hook of the Beesley balance



(left) Testing the yarns, cut to template size, for the counts on a Beesley balance

(right) Using pocket-type calculator for working out answers in towel construction



cloth warehouse are inseparable in the total cost of the yarns purchased to make this shrunk, bleached, and fully finished towel.

"Vital Statistics"

Assume the analysis finally resulted in the following particulars:—

24 ins. wide × 48 ins. long when hemmed.

Hems $\frac{3}{8}$ in. wide which needs $1\frac{1}{4}$ ins. cloth to make $\frac{3}{8}$ in. wide hems.

$1\frac{1}{8} + 1\frac{1}{8}$ ins. $= 2\frac{1}{4}$ ins. less $\frac{3}{8} + \frac{3}{8}$ in. $= \frac{3}{4}$ in.

$2\frac{1}{4}$ less $\frac{3}{4}$ in. $= 1\frac{1}{2}$ ins. to be added for towel cut length.

The towel after bleaching was 24 × $49\frac{1}{2}$ ins. long before hemming. Experience shows that a 24 ins. wide bleached towel usually shrinks $2\frac{1}{2}$ ins. from loom state width and $1\frac{1}{2}$ ins. in the length. The original loom state measurements must therefore have been $26\frac{1}{2}$ ins. wide × 51 ins. long. Similarly, the width of the yarn spread in the reed to weave $26\frac{1}{2}$ ins. grey width cloth would be 2 ins. more, i.e. $28\frac{1}{2}$ ins. reed width.

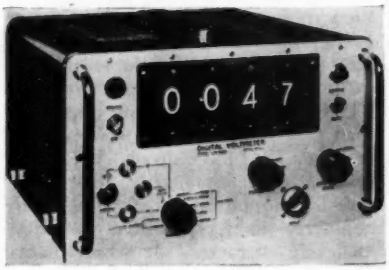
An all-cotton terry towel woven with single cotton yarn in pile and ground, and having $1\frac{1}{2}$% size on the pile and 8% size on the ground warp will lose practically all that weight of size plus a certain loss of weight due to bleaching. The total loss of size and yarn is usually about 10% of the grey cloth weight. Therefore, if the sample towel weighed 10 ozs. bone dry, then 10 ozs. + 5% moisture regain = 10·5 ozs., normal bleached weight, 10·5 × 12 towels = $7\frac{7}{8}$ lbs./doz. bleached state normal weight. The 10·5 ozs. normal bleached weight × 100 ÷ 90 = 11·66 ozs. or 8·74 lbs./doz., original loom state grey weight. The sample bleached towel 24 ins. wide × 48 ins. long with $\frac{3}{8}$ in. hems at each end × $7\frac{7}{8}$ lbs./doz. bleached = 24 ins. wide × $49\frac{1}{2}$ ins. long, cut length before hemming, bleached state, therefore needs to be woven: $26\frac{1}{2}$ ins. wide × 51 ins. cut length per towel × $8\frac{3}{4}$ lbs./doz. in the grey state from the loom.

The particulars determined at each stage of analysis, when extended by the usual methods of calculation should total these final figures. That being so, the costing department can readily find the true cost of production, and the production department faithfully reproduce a woven towel equal and satisfactory in all respects to the sample submitted. Many terry towels contain figured terry patterns, also fancy designs of other than terry weaves in the headings.

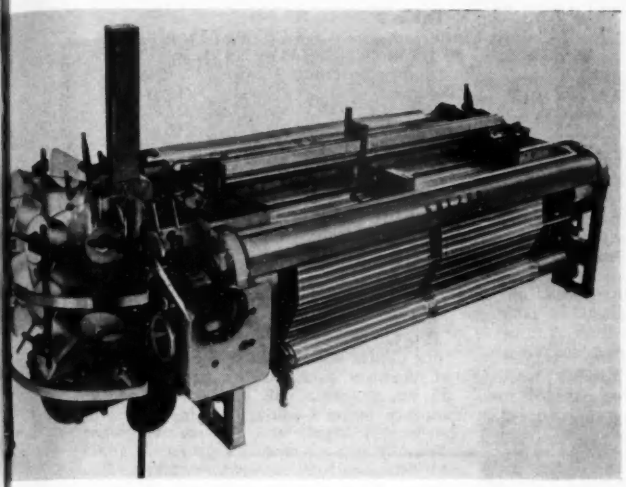
New Four-Figure Digital Voltmeter

THE digital voltmeter, Type LM 902, by Solartron Electronic Group Ltd., Thames Ditton, Surrey, is a development of the popular three-digit voltmeter (LM 901) and is also a transistorised instrument of lightweight, robust construction. The LM 902 is claimed to eliminate all error factors, besides presenting the reading in inch-high, clear figures, which can be read from "across the room" in broad daylight by unskilled and semi-skilled personnel—and to four figures.

The instrument is important in such applications as production testing, the monitoring of dynamic process experiments, process control and the permanent monitoring of system and instrumentation elements. There is *no industry* to which it cannot be useful. The figures are back-projected on to the front display as bright digits against a black (negative polarity) or red (positive polarity) background, or the measured voltage may be isolated or earth-referenced. There are five voltage ranges and the accuracy is stated to be better than 0·1%. There is also a variable dead-zone control for stabilising the reading on fluctuating inputs and up to 40 db. common mode rejection of 50 c.p.s., at the input. The range switch has a "check zero" position and two "standardise" positions for the checking of the reference supplies for positive or negative signals and standardising against a built-in Weston standard cell.



Solartron four-figure digital voltmeter, Type LM 902



The Sulzer type 85 VS. 10 E 4-colour machine of 85 ins. width

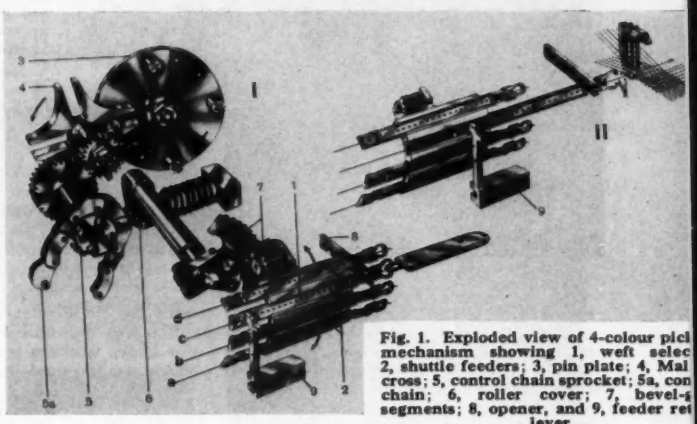


Fig. 1. Exploded view of 4-colour pick mechanism showing 1, weft selec 2, shuttle feeders; 3, pin plate; 4, Mal cross; 5, control chain sprocket; 5a, con chain; 6, roller cover; 7, bevel-g segments; 8, opener, and 9, feeder re lever

New Four-Colour Weft Mixing Sulzer Machine

The heart of the 4-colour picking mechanism is the weft selector upon which four shuttle feeders are fitted in an arc

THE new Sulzer 4-colour weaving machine, Type 85 VS 10E, shown for the first time at the recent textile machinery exhibition in Milan has a working width of 85 ins. (216 cm.) and can be equipped with either a Staubli type dobby for up to 18-shaft or a tappet motion. Insertion of weft by gripper shuttles enables colour-changing to be effected in very simple fashion, a turret-type changer transferring the selected weft thread to the shuttle as required. The changer is controlled by a cam chain with a repeat of up to 200 picks. This repeat can be increased to 400 or 800 picks by two- or four-fold repetition of the same weft colour. Any colour sequence can be selected, including pick-and-pick.

Weft Selector

The heart of the 4-colour picking mechanism is the weft selector (1 in Fig. 1), upon which four shuttle feeders are fitted in an arc. Threads a, b, c and d run from four cones on the package frame to the four shuttle feeders, in which they are held by grippers. One shuttle feeder is always in the working position, i.e. in the plane of the shuttle. (In the figure, for instance, this is the case with the feeder of thread c.)

Cam Control

The choice of shuttle feeder is cam-controlled. The pin plate (3), which is connected to the mainshaft of the machine, drives the control-chain sprocket (5) through a Maltese cross (4). The control chain (5a) which is composed of links having the form of cams, runs over the sprocket (5). When one of the four pins on plate (3) engages with the Maltese cross, the sprocket is turned through one-sixth of a revolution. The link of the control chain which is thus moved forwards acts as a cam and pushes to the right the roller of roller lever (6), which is pressed against the cam chain by a spring. This movement is transmitted through the two bevel-gear segments (7) to the weft selector (1), which thereupon moves the shuttle feeder of thread d into the working position.

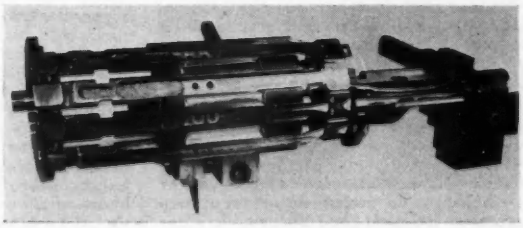
Some of the links in the control chain bring about a change from one colour to another (a-b, a-c, a-d, etc.), while others keep the weft selector in its previous position (a-a, b-b, c-c, d-d).

Thread Transfer and Weft Insertion

The thread is transferred to the shuttle and inserted in the shed in the same way as in the single-weft weaving machine: the thread is gripped by the shuttle gripper; the opener (8) causes the shuttle feeder gripper to release it; the shuttle is picked and pulls the thread into the shed.

11 in Fig. 1 shows how the shuttle feeder grips the end of the thread near the edge of the cloth after it has been inserted. The thread is then severed and the shuttle feeder returned to the starting position by the feeder return lever (9). The control chain is normally moved forward one link as each shuttle is picked. This movement can be interrupted, however, by removing two opposite pins (or three pins) from plate (3). The result is that the thread corresponding to one of the links in the control chain is inserted either twice (or four times) in succession.

The shuttle is picked with the machine in the 125° position; compared with the existing 85 ins. 2-colour machine, of which there are two versions which differ in their picking points, as the type designation makes clear: 85 ZS 10E 140°, 85 ZS 10E 105°. It is at once observed that compared with the first of these 2-colour models, which is used chiefly for weaving worsted and easily worked weft yarns, picking takes place 15° earlier in the 4-colour machine. This means that in spite of the longer path of the changer components in the 4-colour



Overall view of weft selector

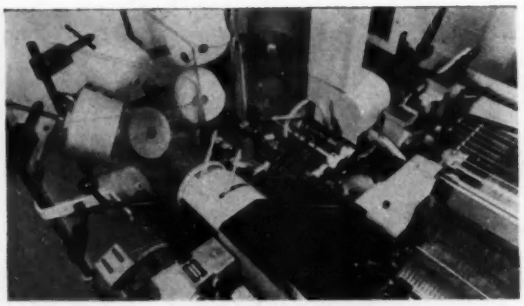


Table 1

Weaving width up to	2-Colour Machines 85 ZS 105°	85 ZS 140°	4-Colour Machine 85 VS (125°) 1 and 2-step	3-step
65½ ins.	235 min.	265 min.	235 min.	215 min.
74 „	235 „	235 „	235 „	215 „
77½ „	235 „	225 „	235 „	215 „
81½ „	235 „	215 „	225 „	215 „
85 „	235 „	207 „	215 „	215 „

(left) Four-colour unit with package frame

as opposed to the 2-colour machine, a smaller portion of the working cycle has been allocated to the changing procedure, so that the maximum speed which can be employed must be smaller. The 4-colour machine can in fact generally attain only 235 p.p.m., while the 2-colour machine picking at 140° can insert up to 265 p.p.m. The great advantage of the earlier pick of the 4-colour machine, however, is that it is able to operate up to greater weaving widths at 235 r.p.m. than the 140° 2-colour model. This is of great importance for instance in the wider articles of carded-wool weaving. If on the other hand the width which can be used with the maximum speed is not utilised, all other conditions being equal a lower shuttle speed will suffice for the machine with the earlier pick. This results in noticeably gentler handling of the weft material and permits economical operation even with less uniform weft yarns.

There will be occasions when the colour pattern with four weft yarns will require the large step change from weft yarn "a" straight over to weft yarn "d" (three-step change), which is avoided if possible in loom operation. The new 4-colour machine is equipped for this also, and can cope with such exceptional requirements without difficulty if the speed is reduced to 215 r.p.m. Moreover, this picking sequence can be employed up to a greater working width. The performances of the 2-colour types and the new 4-colour machine can best be compared from Table 1.

The speeds quoted are examples applicable to a medium weft yarn of, say, 8's cotton count, of mediocre strength and evenness, so that it has to be inserted at a reduced shuttle speed of 72 ft./sec. at most (28° twist of the torsion spring of 15 mm. dia.), and on the assumption that a weft detector is employed on the receiving side. The 85 ZS 140° operates with the maximum speed of 265 r.p.m. up to a weaving width of 65½ ins. Above this, however, the speed which can be used drops to 207 r.p.m. at the full working width of 85 ins. The 85 ZS 105° runs at only 235 r.p.m. even with small weaving widths, but this speed can be maintained up to the full working width of 85 ins. The 85 VS (125°) also runs at 235 r.p.m. up to a weaving width of 77½ ins. using one-step and two-step changes, and at the full working width it still operates at 215 r.p.m. With a three-step change the speed remains at 215 r.p.m. for all weaving widths.

Sulzer Bros. feel that the 85 ins. 4-colour machine should be an ideal machine for worsteds and carded yarns, as working widths up to 85 ins. in the reed and a mixture of the same sort of weft yarn or weft changes for pattern formation up to a repeat of 200 picks are sufficient. In some cases the employment of the machine in cotton weaving mills will also be justified. For larger working widths, e.g. 130 ins., which are favoured in cotton weaving as they permit wide cloths or multiple widths of narrower cloths to be produced, the 85 ins. machine will later be joined by another, larger 4-colour machine.

Eliminating Battery Filling on Automatic Looms

Weft pirns are transferred from containers straight into the shuttle

THE new ALV automatic bobbin loader, recently announced by George Fischer Ltd., is a pirn changing device with a pirn container stated to be at least eight times larger than conventional vertical and circular magazines. As will be observed from Fig. 1, the weft pirns are transferred from the containers into the shuttle without any battery filling.

Preparation of the pirn, formerly performed by the battery filler is now done by the ALV. The preparation is initiated by the hammer movement transferring the previous pirn into the shuttle and is controlled pneumatically by a central control motion. The preparation consists in gripping and holding the end of the pirn. For this purpose the pirn winder provides every pirn with a nose burich. The nose bunch is gripped by a pair of strippers, passes into a suction nozzle and is then clamped. In this way, the same position of the ends from the new and the exhausted pirn are obtained, like on the conventional pirn changer. A special temple cutter in conjunction with suction nozzles efficiently removes cut ends.

New Pirns

The problems of winding a nose bunch has been successfully solved and there are no difficulties for new and recent pirn winders. It is, however, necessary to provide new automatic pirns, because the pirn must have a tip which can take the nose bunch. The nose bunch—a small reserve bunch of about 20 turns with a free end—should be placed about ¼ in. from the tip of the pirn. The pirn tip should not have a metal shield and no grooves for about ¾ in. The rest of the pirn is not altered. Fig. 2 shows the difference between normal pirns and ALV pirns. It is, of course,

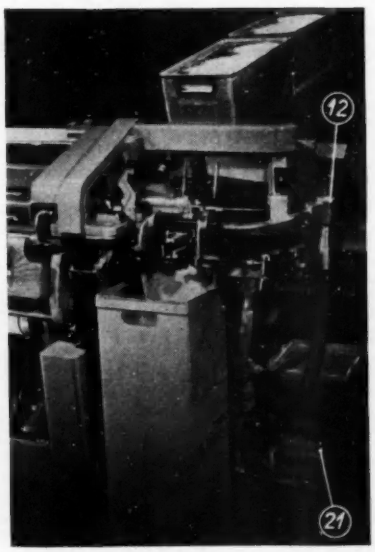


Fig. 1

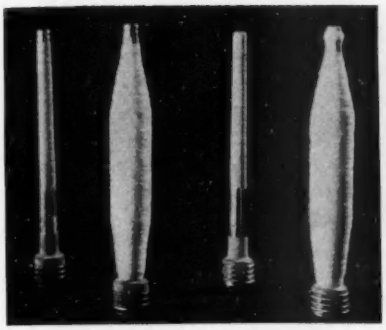


Fig. 2

possible to use alternative types of pirns as along as the tip will hold the bunch.

The pirn winders are provided with an automatic stacking motion to stack wound pirns into the container, all with their heads the same way. These containers holding pirns wound on one or two spindles are then transported direct to the loom. The pirns are not touched by hand as they are transferred automatically from container to shuttle.

Pirn Containers and Pirn Feed

According to the make of the pirn winder and size of the container, one container holds between 72 and 144 pirns (pirn head dia. 30 mm. = 1 $\frac{3}{16}$ ins. It is usual to have two pirn containers on one loom, thereby doubling the weft reserve. When one container is empty it is removed to the side rails and the new container slides into position and is made ready for use by a simple lever movement. Moving the lever (Fig. 3) opens the bottom slide of the container and the pirns are transferred by gravity to the pirn guide, and the preparation and change positions. A pirn lifter (Fig. 5) ensures safe transfer of pirns from container to pirn guide (Fig. 4). The lifter, operated by compressed air from a central control motion operates only during preparation of pirns. Compressed air entering the valve 1 to the piston 2, raises pirn lifter 3 into the opening of the pirn container until a pirn lies in the bed 4 of the lifter and thereby presses the pin 5 of the feeler valve 1.

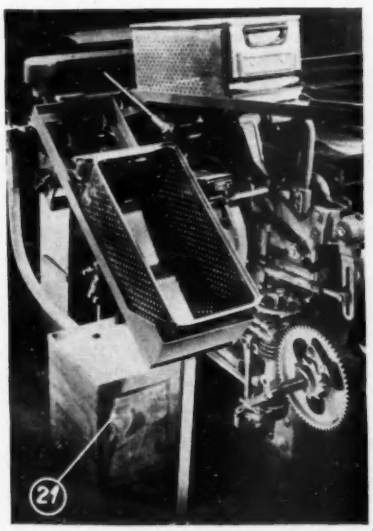


Fig. 3

Preparation for Transfer

The pirn remains in the same condition on leaving the pirn winder until in preparation position for the transfer. As the pirn hammer transfers a pirn, it switches on the control motion for the preparation of the next pirn. Preparation of the second pirn begins only after the transfer of the first pirn and is therefore unhurried. As the preparation is controlled pneumatically, every loom must be connected to a compressed air system of about

Fig. 4

5 atmospheres. When the electric motor 10 of the control motion (Fig. 6) is switched on by the hammer movement the eccentric shaft 11 makes one complete turn. The various eccentrics operate compressed air valves for certain periods whereby the pistons in the automation carry out their operation.

The sequence of operations for pirn preparation is as follows:—

(1) The hammer movement switches on the control motion.

(2) Compressed air enters the injector 12 (Fig. 7) producing a vacuum in the nozzle at the shuttle-eye cutter.

(3) The opened stripper jaw moves over the pirn tip and closes behind the nose bunch of the pirn to be prepared.

(4) The piston 16 presses the pirn hammer 17 on to the pirn head thereby fixing the pirn for stripping-off the bunch between the pirn guide and pirn clip, and the pirn hammer 17. The pirn lifter (Fig. 5) operates as already described. The control piston of the gripper plate 19 (Fig. 7) opens the connection from the injector 12 to the main nozzle 20 and the suction thereby obtained removes the clamped changing ends from the gripper plate 19 into the waste container 21 (Fig. 1).

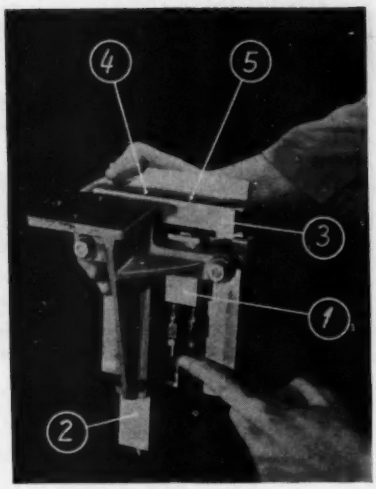


Fig. 5

(5) The closed stripper jaw 14 returns to its original position and the nose bunch passes into the main suction nozzle. The stripper jaw then reopens.

(6) The gripper plate 19 closes the connection from the injector 12 to the main nozzle 20 and clamps the end of the prepared pirn; piston 16 returns to its rest position. The pirn lifter is stopped.

(7) The compressed air to the injector 12 is stopped; nozzle without vacuum.

(8) Control shaft 11 has made one turn and the electric motor 10 is switched-off.

The entire preparation of the pirn takes about 5 secs. The prepared pirn is now ready to be transferred into the shuttle whereupon preparation is repeated for the next pirn.

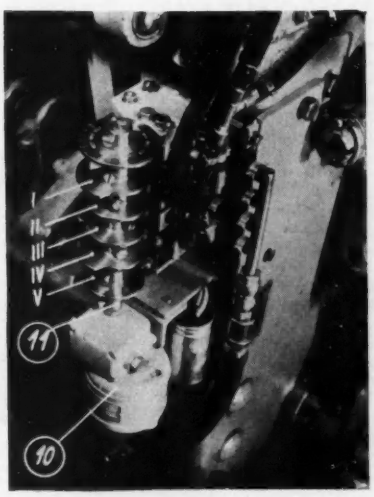


Fig. 6

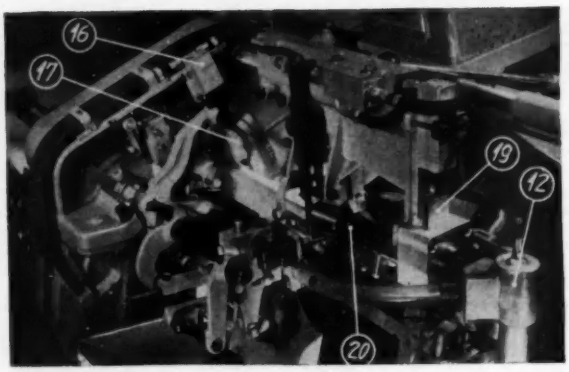


Fig. 7

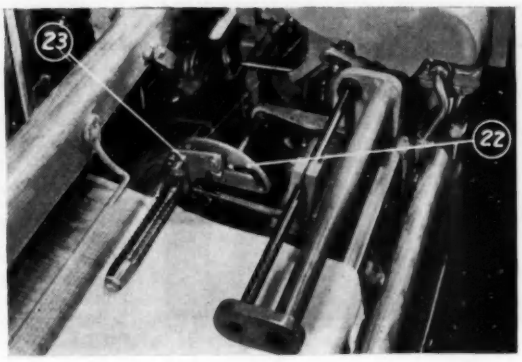


Fig. 8

Pirn Transfer

Pirn transfer is initiated in the normal way by a mechanical or electrical weft feeler. The battery latch is lifted and engages its bunter on the sley, and the pirn hammer knocks the new pirn into the shuttle.

The problem of changing ends has received special attention.

A special temple cutter 22 (Fig. 8) and the suction nozzles ensure complete removal of the cut ends and prevent lashing-in. When, after the initiation of a change the shuttle with the empty pirn comes to the automatic side, the shuttle-eye cutter is already in the change position and during the forward movement of the sley the shuttle-eye cutter cuts the end of the old pirn close to the shuttle-eye. At the same time, it holds the end from the selvedge. During the backward movement of the sley the temple cutter 22 comes into operation and cuts the end from the exhausted pirn close to the selvedge. This end therefore is cut only half a turn of the sley after the pirn transfer. The cut end is immediately drawn into the suction nozzle.

The temple cutter 23 is controlled by a cam on the sley sword. As the sley goes back for the second time after pirn transfer, the temple cutter repeats its operation and cuts the end between the selvedge and the gripper plate 19 (Fig. 7). When the gripper plate reopens for the preparation of the next pirn the cut end is drawn off and passes into the waste container 21 (Fig. 1). The ensuing forward movement of the sley brings the temple cutter into rest position where it remains until the next pirn transfer takes place.

Extended Uses of 21 oz. Monofil Hosiery Package*

SINCE the announcement of the 21-oz. package for 15 den. monofil, experience has shown that it can usefully cater for both seamless and fashioned hose knitting, in 20 as well as 15 den. monofil yarns. From observations of the performance of this package under factory conditions, some of the original recommendations for its use have been revised and so, to avoid confusion, the details are repeated in full. The package is designed to give the following benefits:

(1) A considerable reduction in the percentage of seamless hose showing tension rings.
(2) More uniform stocking leg-lengths.
(3) Less time spent by the knitter in changing and handling packages.

To obtain the best performance from the new package it is essential to pay attention to the following points:

Seamless Knitting

The package must be held rigidly on the machine. A wooden peg 5 ins. long and 1⅛ ins. dia. is ideal for this purpose.

The first take-off guide should be a small eyelet or pigtail accurately aligned over the centre of the tube. This guide should be 4½ - 9 ins. directly above the nose of the package.

The most satisfactory tensioning device is a gate type fitted with ceramic eyelets and either ceramic or porcelain friction rollers. In the case of mesh machines, porcelain rollers may be necessary to increase the tension level slightly.

Fashioned Knitting

The package must be held rigidly on the knitting machine. Where space above the package is limited a base made to B.N.S. Drawing No. 561/13662* will give a firm mounting.

The first take-off guide should be a small eyelet or pigtail accurately aligned over the centre of the tube. The clearance above the packages in the yarn boxes of most fashioned machines is insufficient for good knitting performance and the raising of the box tops, or their complete removal, is necessary to achieve the best results. The take-off guide should be 4½ - 9 ins. above the nose of the package.

Wetting-out is not recommended.

General

The package must be handled with care during removal from the carton and setting-up on the machine. If the yarn is handled the outer layers may give trouble in knitting. Hold the package by the ends of the tube.

A P.V.C. knitting cap is essential for good yarn take-off. A suitable design is available from Cascelloid Ltd., to B.N.S. Drawing No. 041/10813.

The path of the yarn from package to knitting point should be arranged with the minimum number of changes of direction and the new hard ceramic materials used, whenever possible, for the yarn contact points.

Failure to locate the first guide eye accurately over a rigidly held tube will cause uneven take-off tension, especially when the package is nearly empty.

* * *

International Wool Conference

Preliminary details have been announced about the International wool conference to be held at Harrogate in May 1960 as part of the Textile Institute's jubilee year celebrations. The official opening of the conference will be on the 19th, and lectures, with woolmen from all over the world participating, will continue until the 26th. On the 21st there will be a luncheon at Leeds University for all delegates, and on the 25th visits will be made to Bradford and Huddersfield firms. A farewell party is planned for the 27th. Donations to assist in the organisation of the conference have come from the International Wool Secretariat and the Wool Textile Research Council.

* *Advance Report No.* 21 *issued by British Nylon Spinners Ltd.*

* *Bobbin bases in wood can be obtained from Aeroplack Ltd., Albion Place, Albion Street, Cheltenham, and Staybel Products, Burnsall Road, Canley, Coventry; or in metal from Christopher Metals, Baldock, Herts.*

TEXTILE MACHINERY and MILL EQUIPMENT NEWS

Centralised Production Control

Details of a central production control system in spinning and weaving, which is said to have resulted in appreciable savings by higher machine and operative efficiencies

THE problems facing the U.K. textile industry generally and the cotton industry in particular together with suggested remedial action have been the subject of many discussions during recent months, said Mr. A. P. Perrin (Electronic and Telecommunications Division, Hasler Telegraph Works Ltd.) at a recent press conference in Manchester, where Hasler instrumentation systems for the textile industry were demonstrated. These problems, he went on, could not be solved by any "package plan" or gimmick or by decrying the efforts made by the progressive elements in the industry. Analogies had recently been drawn between the birth of the industrial revolution with the introduction of the steam engine, and the "rebirth" of the cotton industry under the stimulus of current reorganisation plans and the shift in world trading conditions, which seemed to call for a drastic reduction in capacity together with the introduction of modern machinery, fully integrated on a multi-shift basis to justify the capital investment.

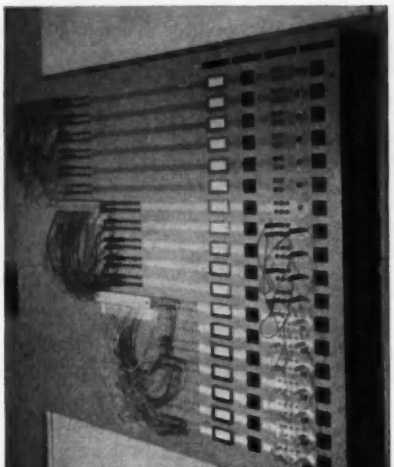
Automation, continued Mr. Perrin, presupposed a continuous production flow, manufacturing a narrow range of products, using highly specialised low flexibility machinery; its usefulness, at present for the cotton industry, was therefore limited. Hasler's idea is to introduce systems which form a compromise between stagnation and full automation, equally applicable to firms spinning or weaving a wide or narrow range of counts or end products.

In their opinion there is a place in any reorganisation policy, for centralised control systems for apart from the advantages to be gained from increased machine utilisation and logical operative deployment, it showed the manager where his presence was more required. It further relieved management of many routine duties.

The following information is based on an appraisal of the system by Mr. D. Brunnschweiler, M.Sc.(Tech.), F.T.I., after visiting the French installation in the mill of Filatures et Tissages de Wittenheim, which comprises a spinning section of 3,500 ring spindles, and a weaving section of 174 single shuttle automatic looms. The weaving section utilises about 15% of the yarn produced (average count 20s cotton), the remaining 85% being sold on ring tube, primarily to French hosiery manufacturers. Most departments have been re-equipped with machinery during the last ten years, although some old equipment is still in use. A very comprehensive system of production control has been installed which has already excited considerable interest among textile technologists in Britain. The system has

Mr. A. P. Perrin (Hasler Telegraph Works Ltd.) discussing the new system with Mr. A. E. De Barr (head of spinning department, Shirley Institute) Mr. D. Brunnschweiler and Mr. V. Duxbury, of Manchester College of Science and Technology

The central control room, designed to show the manager where his presence is most required and which also relieves management of many routine operations.



Material flow indicator in the main control room. One series is provided for each spinning floor, with a total of seven qualities on the first floor, five on the second and six on the third. Plug-in "jacks" allow the production of all the processing machinery at each stage employed on one order to be grouped together and totalised on one counter with a second counter displaying the required production

several diverse and quite distinct functions, and while it is not expected that each of these functions will be of immediate interest in every British mill, it is believed that almost every mill will be able to derive benefit at some stage, by the installation of production control equipment.

On each of three floors at the Wittenheim mill are situated cards, drawframes, single passage flyframes and 30 ringframes. Thus each floor forms a self-contained spinning section. Next to the manager's office, and adjacent to the testing laboratory, is situated a control room in which the Hasler control equipment is fitted, production on all three floors of the mill being completely regulated from this room. All such equipment is of very simple and reliable design, presenting no maintenance problems.

Labour Grades

Labour in the spinning room is divided into three distinct categories: (*a*) spinners, who do nothing but piece broken ends; (*b*) creelers, who operate as a team according to a pre-arranged plan, and (*c*) doffers, who operate as a team, taking instructions from the control room via a mural indicator by the ring frames. The indicator shows the number of the next frame requiring doffing, and in how many minutes' time each doffing must take place. The minutes are automatically counted down, and when only one minute remains, the head doffer collects her team at the frame indicated, ready to stop spinning and commence doffing immediately zero appears on the indicator.

The controller at the console in the control room plans in advance the order of doffing on the 90 ringframes in the mill. This is done by knowing the time to fill each ring bobbin, given the count, bobbin size and speed. The controller has confirmation of the accuracy of his forecast, indicated by lights on the control panel, which also confirm that doffing is taking place.

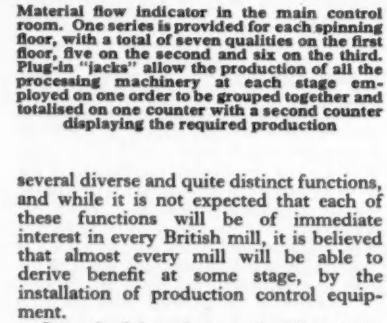
Should the bobbins on two frames become full together—a fairly frequent occurrence—the controller will spin short on one frame, initiating doffing earlier. Clear instructions are given as to the frame priority in such a situation. In this way, there is no machine interference time, i.e. zero time waiting for doffing. The controller plans the doffing sequence on a piece of graph paper, and the forecasted bobbin filling times are accurate to about ± five mins. The system is flexible, allowing for almost any bobbin filling times. When visited, these times ranged from approximately 2½ to 10½ hours.

When the shift changes, the controller hands over the doffing programme to his successor, so that there is no disruption. The controllers were 17 and 18 years of age respectively, and appeared to find their work simple but interesting. It is conceivable that with a larger installation, one controller might be insufficient, so that the part-time services of one of the assistants in the adjacent testing laboratory would be necessary. Taking into account the 90 ringframes over two shifts, whereas formerly a total staff of 90 persons was involved for doffing, the same duties are now undertaken by 60.

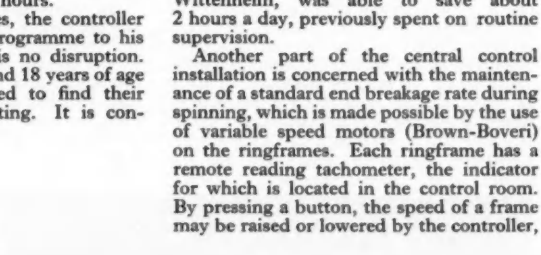
In addition to the equipment already mentioned, each ring and flyframe has its own production counter situated in the control room, together with a multi-channel running time recorder. The controller is responsible for indicating on the running time recorder, the reason for every stoppage other than for doffing. The charts from the recorders, together with the paper on which the doffing programme is worked out, form a complete record of the operation of the spinning section.

It is the duty of the controller to see that the production of the flyer and ringframes keeps in step, to forecast when the production for a given order is complete, and to issue instructions for the commencement of the next order. A special plug board fitted with production counters is used to link the production of machines on the same count and quality of material. If the production should be unbalanced in any way, this is immediately apparent, and necessary adjustments are made without delay. The production outstanding for a given order is always visible, so that it is easy to see whether delivery times are being adhered to, and there is no danger of over-production. The required and actual production figures are displayed in each room for the operatives' information. This particular aspect of the central control installation is a manager's dream. The manager has complete control over the production of the whole mill without leaving his office. He can see at a glance where he is most needed, and can attend to unexpected developments without delay. Mr. Bolle, the spinning manager at Wittenheim, was able to save about 2 hours a day, previously spent on routine supervision.

Another part of the central control installation is concerned with the maintenance of a standard end breakage rate during spinning, which is made possible by the use of variable speed motors (Brown-Boveri) on the ringframes. Each ringframe has a remote reading tachometer, the indicator for which is located in the control room. By pressing a button, the speed of a frame may be raised or lowered by the controller,



(left) Indicators for doffing team control (in ring rooms (are at each end). Frame No. 5 is being doffed. The lower digits indicate the number of minutes left before doffng began. This indicator counts down automatically to zero from the time the controller indicates the forecast signal



(right) Efficiency recorder in Weaving Manager's office. Indicators on the right show which work plan is currently in operation. A light is provided for each loom. The row of buttons immediately below the light panel allow for the compensation of looms out of service for known reasons (routine maintenance, etc.)

this being achieved by means of a small servo-motor operating the variator of the variable speed motor. The criterion of machine speed is the end breakage rate, the index of which is the amount of waste extracted by the "Pneumafil" installation on each frame. At regular intervals, an operative visits each frame to weigh and record the waste, this being done on a special trolly equipped with a balance. If the waste extracted exceeds a predetermined quantity, the spindle speed is reduced, and conversely. The amount of waste is also used as an element in determining the wages of the spinner.

Most of the production at Wittenheim is sold on ring tubes packed in boxes for dispatch. A novel system of tube handling being installed ensures that after doffing the tubes are untouched by hand. The doffers place the full tubes on a shallow trough running along the front of the frame, whence they fall by gravity through plastic piping to an intermediate storage hopper.

A control desk is provided which channels tubes filled with a particular quality of yarn to the appropriate hopper. The hoppers are situated over a conveyor belt, the hopper flaps and conveyor movement being actuated by the operator at the control console. When the contents of the hopper are discharged, the conveyor transports the tubes through a humidifying machine and thence to the automatic box packing machine. The packing is done automatically with the exception of nailing the lid on the case.

The control console for tube selection and packing incorporates a mimic diagram showing the quality and number of ring-frames feeding to the various hoppers, and from the hoppers to the packing station. One flow line is provided for each of the spinning rooms. Mural indicators provide advance information to the packing room supervisor of the type and order being transported on the conveyor belt in accordance with signals initiated by the operator at the console. This, together with a telephone link, ensures complete co-ordination of the transport and packing operations. The packing control console is not located in the main production control room.

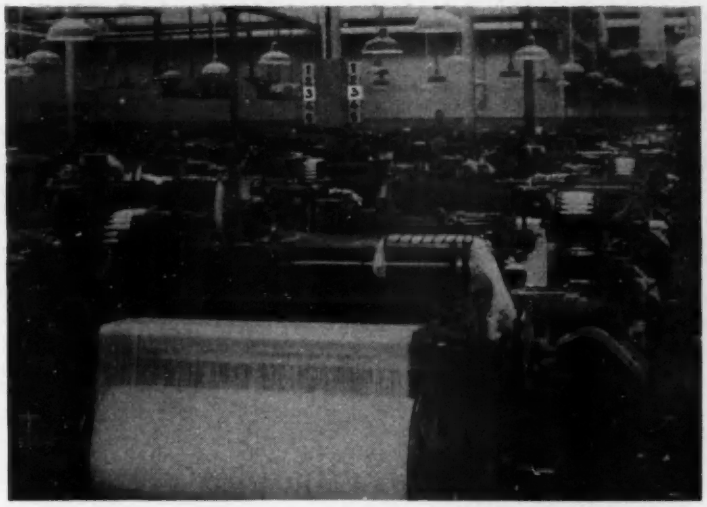
The production control installation for the 174 automatic looms is simpler than that for spinning, consisting of a single lamp panel and recorder in the office of the weaving manager. Every loom has its own lamp on the panel, arranged according to the floor plan in the weaving room. When a loom is running, its lamp is lit, the circuit being provided by the motor starter contactors. The combined efficiency of all the looms is continuously recorded on a single channel recorder, which in effect, makes a snap reading of the proportion of looms running every 3 secs. Should the pattern of efficiency vary from the normal daily variation, this is immediately visible, and remedial action can be taken. Similarly, the manager can see which looms are persistently stopped, and determine the cause by telephone without actually visiting the weave room.

A unique method is used to maintain the overall shed efficiency at a high level by re-distributing work amongst the weavers according to transient conditions. Normally, 5 weavers are employed each shift, assisted by 2 helper or smash weavers. If the efficiency falls below a predetermined level, the helper weavers leave their individual looms stopped for lengthy periods in the following manner. Immediately the efficiency falls below 85%, mural indicators in the weaving shed are automatically illuminated, and the weavers adjust to new loom sets by incorporating one helper weaver. Thus, a weaver previously tending 40 looms, takes over a reduced set of 32, the helper weaver tending the remainder. Should the efficiency drop below 80%, the second helper weaver takes over a set of looms in a similar manner. Thus, the following arrangements are in use at present:—

Plan 1: Above 85% efficiency—5 weavers
Plan 2: Above 80% efficiency—6 weavers
Plan 3: Above 75% efficiency—7 weavers

Normally, on a change from Plan 1 to Plan 2 being indicated, the introduction of the extra weaver will cause a steady rise in efficiency, which must be maintained for some pre-determined time (10 mins. at present) before a reversion to Plan 1 is indicated. Changes in Plan are indicated and take place quite automatically. There is simultaneous indication in the shed and the manager's office of the number of the Plan in operation. It is within the control of the weaving manager to initiate a change of plan by push button, but the exercise of such overriding control would be unusual.

The wages of each weaver are determined by pick counter readings in the usual manner, but these values are weighted in proportion to the time spent per shift on the various plan numbers. On Plan 1, a somewhat higher wage rate is paid than on Plan 2, and so on. Thus the weavers have an incentive to maintain the general shed efficiency at a high level. It is considered that the introduction of helper weavers when overall efficiency falls has a beneficial psychological effect on the weaving and ancillary personnel. During the first year of operation of the weaving control system, there has been an overall rise in loom efficiency of 3% to 5% (depending upon the particular fabric being woven).



This view of the weaving shed shows the indicator displaying the work plan in force —in this case Plan 3

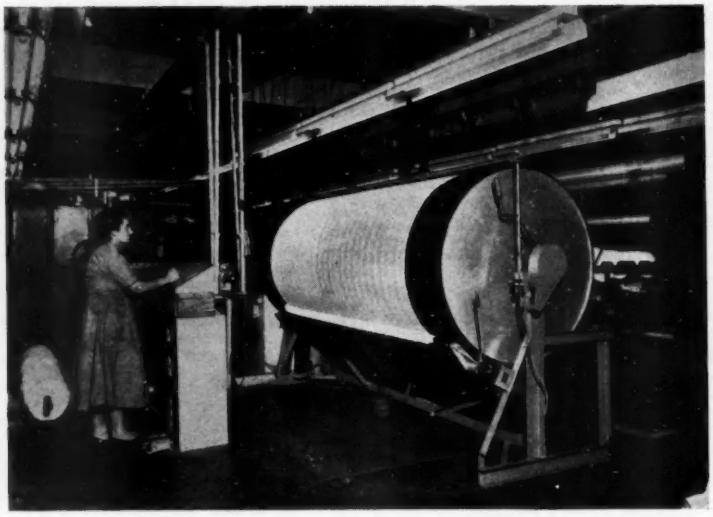
New Tensionless Inspection Machine

THE new Jersifab inspection machine made by G. Durrant and Sons Ltd., Stockport—and shown in the photograph in operation in the factory of the inventors, Jersey Fabrics Ltd., Nottingham —is tensionless and suitable for lace, net, man-made fibre fabrics, light film and plastic and, of course, knitted and jersey fabric. Tension is eliminated because as the inspection drum turns, the material gently rolls off the unwinding arbor, and lays on the surface of the drum, without any stress being placed on the material, and also avoiding any stretch. On the other side of the machine, the material is gently picked up from the drum, and surface wound, on the take-off arbor.

A valuable feature of the machine is the tensionless measuring, which is carried out during the process of inspection, the measurement being taken from the drum. The speed of the machine can be regulated by electronic control, to give infinitely variable speeds between 10 and 60 yds./min. Another distinctly useful factor is that the stand, which contains the rolls

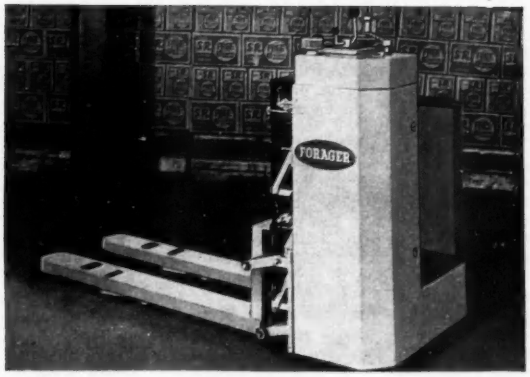
to be inspected, also has provision to receive the used arbors. The new roll can be inserted without any form of lifting and the roll can also be removed at the front of the machine, without lifting, by placing a cart in position and moving a lever over until the roll rests on the cart. The machine can also be provided with the Durrant patent fault recorder, shown in the photograph, and also with a machine for mending and sewing, as the process of the operation continues. In all cases where a good roll is put on to the machine, then the construction of the machine, and the operation of the machine, ensure the production of a good roll after inspection.

Further details can be obtained from G. Durrant and Sons Ltd., and demonstrations can be arranged upon request.



(right) The Durrant Jersifab inspection machine

High Capacity Finger Pallet Truck



Hirst "Forager" battery finger pallet truck

A NEW addition to the range of Forager trucks is announced by A. Hirst and Son Ltd., Crescent Works, Meadow Lane, Dewsbury. Electrically-driven and powered by a 24 volt heavy duty traction motor, this 2,000 lbs. capacity finger pallet truck is remarkably manoeuvrable and easy to control, the solid rubber press-on tyres and taper roller bearing wheels resulting in a particularly smooth ride. The drive is from the rear wheel through a heavy duty worm gearbox and duplex chain. The truck has three forward and three reverse speeds covering a speed range of 1½ to 4 m.p.h. with an efficient transmission brake, operated by a control handle. Another notable feature is the 5 ins. lift, powered by a separate pump motor unit with a special control and relief valve.

Digital Voltmeter for Wide Industrial Use

The "999" digital voltmeter

THE new Solartron "999" digital voltmeter Type LM.901 displays the measured voltage in large, plain figures which may be read at considerable distance from the instrument and, if necessary, by untrained personnel. Manufactured by Solartron Electronic Group, Ltd., Thames Ditton, Surrey, the LM.901 is lightweight and of compact and robust construction. Being transistorised it is rugged though small, and may be used on the laboratory bench, in the factory, control room or in the field.

The applications of this instrument are as wide as the fields of science, technology and industry are themselves. It may be used as an independent instrument or as a module in large installations. The voltage range is from zero up to 99·9 volts in three sub-ranges, or 109·9 volts when using the range extension facility. The measured voltage is continuously monitored and the readings change with any variation. Alternatively, varying voltages may be periodically measured by turning a switch and pressing a "sampling" button when a new reading is required. The figures then remain at the last reading until the button is pressed again.

The "in-line" digital display gives clear, white digits on a black or red background, according to the polarity. This presentation is achieved by a back projection system. The display may also be located remotely, or two displays may be operated from one digital voltmeter unit. Simultaneously, the information displayed may be printed-out or otherwise recorded by a connection to the rear socket, which provides an output of full decimal coded information equivalent in value to that indicated by the display.

THE TEXTILE
COLOURIST & FINISHER

Recent Developments in Dyeing and Finishing

Developments discussed include the dyeing of polyolefine fibres, shrinkage of nylon yarns during steaming, fluidised beds in drying, printing black patterns on cotton fabric, also new testing apparatus for determining crease-resistance

By B. C. M. DORSET

INCREASING use has been made during the past few years of organo-silicon compounds for application to textile materials for conferring on them a high degree of water-repellency. Such compounds are generally silicones or siloxanes which result from the hydrolysis of organo-silanes containing organic groups linked to the silicon through carbon-silicon linkages and also hydrolysable substituents directly attached to the silicon. It is believed some kind of bond is formed on the fibre surface between the silicone and the fibre substance to give water-repellency fast to washing. Quite early it was discovered (B.P. 708,821) that by having an organo titanium compound present during the application of the silicone that the degree of water-repellency obtainable was greater than could be obtained from either type of substance applied in comparable amounts.

This early use of combinations of silicones and organo-titanium compounds (the latter capable of undergoing hydrolysis to yield an hydroxide or oxide of titanium) was mainly in finishing textile materials whose fibres were able to imbibe appreciable amounts of water when wetted, e.g., cotton, acetate, and nylon fibres. A typical example is useful as showing the synergistic character of such a finishing treatment. Cotton gaberdine fabric was impregnated with a solution containing 1·75 parts of silicone and 0·25 parts of tetrabutyl ortho-titanate in 98 parts of petroleum spirit (b.pt. 130 to 180°C.), then dried and heated at 150°C. for 2 mins. This treatment was repeated on fresh samples of cotton fabric but omitting first the silicone and then the tetrabutyl titanate. The results given in Table 1 were obtained in water-repellency tests.

The particular silicone used in this example and one that is generally favoured consists of a mixture of 60% of trimethylsiloxy end-blocked methylhydrogen polysiloxane having the formula shown in Fig.1, and 40% of trimethylsiloxy end-blocked dimethylpolysiloxane having the formula given in Fig. 2.

Recently it was found (B.P. 814,899) that much the same kind of finishing treatment could be used to confer water-repellency on textile and sheet materials such as "Terylene" and even on rubber and cellulose acetate. Such hydrophobic materials are substantially imprevious to water but they do allow moisture to condense on their surface so as seriously to interfere with their electrical conductivity. In the case of sheet materials it is not necessary to carry out a curing stage at a temperature exceeding 100°C., and it is possible to vary considerably the ratio between the amounts of silicone and butyl titanate without adverse effect on the water-repellency obtained; much depends on the nature of the material being treated.

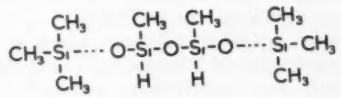


Fig. 1

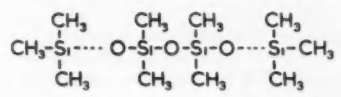


Fig. 2

Table 1

Treatment of Fabric	Water-repellency Tests	
	Water Absorption	Water Penetration
Not proofed	183·0%	106 c.c.
Treated with 1·75% of silicone	110·3%	68 c.c.
" " 0·25% of tetrabutyl titanate	89·0%	43 c.c.
" " 1·75% of silicone + 0·25% of tetrabutyl titanate	43·5%	Nil

Dyeing Polyolefine Fibres

Recent developments in the production of fibre-forming polymers have been much concerned with polymers derived from olefines such as ethylene and propylene since it is foreseen that being obtained from waste natural gases or from gases easily obtained by

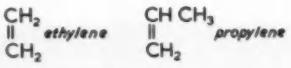


Fig. 3

cracking less useful heavy petroleum fractions these polymers can become the source of really cheap synthetic fibres. Ethylene and propylene are typical of such olefines and as Fig. 3 shows, they are unsaturated compounds. Improved types of catalyst now make it relatively easy to ensure the production of linear polyolefines such as Fig. 4.

Strong and highly durable fibres having high melting points have been made from these new polyolefines, but the strong hydrophobic properties make them difficult to dye using ordinary dyes and methods. It is foreseen that before these potentially useful fibres can become widely used for textile purposes it will be necessary to devise satisfactory dyeing processes. This aspect has not being overlooked and progress has been made. For example, a new German dyeing process (B.P. 814,582) is based on the use of special dyes dissolved in hydrocarbons which are then dispersed as ultra-fine droplets in water.

The dyes used are those which are so-called fat-soluble and include Fast Red A, Fast Yellow, Fast Ponceau LB and other similar blue and green dyes. They can be readily made into aqueous emulsions with the aid of a paraffin or napthene hydrocarbon oil assisted by the use of an emulsifying agent such as Soromine SG (a fatty acid polyethylene glycol condensation product), Emulphor ST Special (a reaction product of ethylene oxide with an alkylphenol),

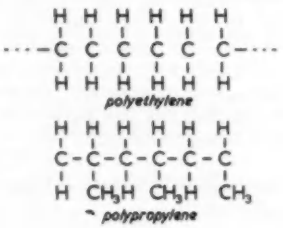


Fig. 4

and Leonil OS (the reaction product of high molecular weight fatty alcohols with ethylene oxide). The aqueous dye liquor is such that it contains 2 to 6% of dispersed oil containing the dye in solution. Dyeing is effected under ordinary conditions at about 50°C. but it is necessary to take special steps, e.g., after-washing with an oil-solvent (say carbon tetrachloride) before washing with soap in order to remove all the oil adhering to or absorbed by the textile material. It is claimed that the use of oil as a dye solvent much improves the amount of dye taken up by the polyolefine fibres.

It is obvious that such a dyeing process has all the disadvantages associated with the use of organic solvents instead of water but it is necessary at present to have a dyeing process of some kind which will allow coloured polyolefine fibres to become available so that their value to the textile industry may be assessed. Improvements in dyeing will undoubtedly come later as the demand for the new fibres becomes established.

Shrinkage of Nylon Yarns During Steaming

Munden and Slater have recently published an interesting paper dealing with the shrinkage in length which ordinary multi-filament 6,6-nylon yarn may suffer when treated with steam under a pressure of 40 lbs./sq. in. creating a temperature of 140°C. The results are interesting to all who deal with heat-set nylon goods and not least to those dealing with the textured synthetic fibre yarns now widely used to make snugly fitting garments and footwear.

A linear relationship exists between the degree of shrinkage and the temperature of steaming and when the yarn enters the steaming chamber it becomes fully shrunk within 6 mins. Provided the yarn is completely free to shrink all the time it does not matter whether any particular steaming temperature is attained at once or in a series of stages for the total shrinkage will always be the same for that temperature; for a temperature of 136°C. it will be 10·6%. Thus if the yarn is first steamed at 108°C. it will shrink 7·4% and if the steaming temperature is then raised to 136°C. it will shrink a further 3·2% to make a total shrinkage of 10·6%. The average increase of shrinkage with steaming temperature increase is $0{\cdot}107 \pm 0{\cdot}019\%$ per 1°C. and no effect associated with yarn twist, filament or yarn denier has been observed. This shrinkage coefficient applies to all the 6·6-nylon yarns investigated.

Although the total shrinkage produced in a nylon yarn by steaming it at any given temperature is independent of any steamings at lower temperatures (provided that at these lower temperatures the yarn is free to shrink) a previous dry heat treatment does modify the subsequent steaming shrinkage and this is important since in processing nylon goods these are often first dry heat-set (often while held to a definite size) and later set in

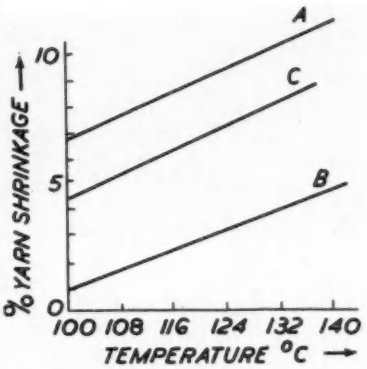


Fig. 5. Curves showing the free shrinkage in steam up to 140°C. of nylon yarns (A) without pre-treatment, (B) set by any heat whilst free to shrink and (C) set by the same dry heat but held to length

saturated steam. Munden and Slater have measured the effect of free and restricted dry heat-setting of nylon yarns on the subsequent shrinkage produced by a high temperature steaming and the results are shown by the straight lines in Fig. 5. Line A shows the straightforward shrinkage up to 10·6% of a nylon yarn introduced directly without previous treatment into a steaming chamber fed with steam at 40 lbs./sq. in. Line B shows the somewhat smaller total shrinkage suffered during similar steaming of a yarn which has previously been heat-set under conditions allowing its free shrinkage. Line C shows the much smaller total shrinkage suffered by a yarn previously heat-set while held at its original air-dry length. It will be observed that lines B and C are parallel, showing that the increases in shrinkages produced in steam are just about the same.

An interesting point concerns the free shrinkage of nylon yarns in steam which have previously been dry heat-set and steam heat-set at 120°C. while free to shrink. The straight lines in Fig. 6 summarise the shrinkages produced in steam as the temperature is raised from 100°C. to 140°C. Referring to lines A and B it is at once observed that the dry heat-set yarn (A) shrinks about 1½% at 100°C. whereas the steam heat-set yarn (B) does not commence to shrink further until the steam temperature reaches 120°C. Again the steaming shrinkages run parallel to each other and are linear.

From the above it appears that the shrinkage experienced by a nylon yarn during steaming up to 140°C. depends on its previous thermal treatment and this would suggest that by applying a steaming treatment to any nylon yarn it is possible to learn something about

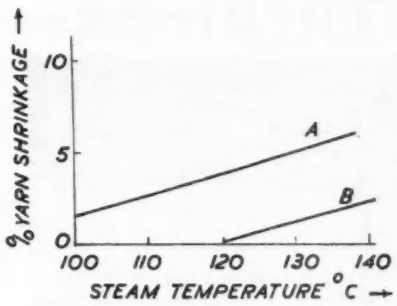


Fig. 6. Curves showing the free-shrinkage in steam of nylon yarns which have been previously set at 120°C. while free to shrink with (A) dry heat and (B) steam

its previous heat and shrinkage treatments. Munden and Slater have indicated how this can be done by the following recommended method.

Let it be supposed that a sample of nylon yarn has been heat-set at temperature T′ under conditions where it is free to shrink and a subsequent user of the yarn wishes to know the value of T′. For this purpose the yarn should be steamed at 140°C. for about 6 mins. and the residual yarn shrinkage noted, say R. Now it is known that the coefficient of shrinkage for nylon yarn is approximately 0·10% per 1°C. Hence

$$T' = 140°C. - \frac{R}{0{\cdot}1}$$

Thus the original heat-setting treatment was carried out at a temperature (T′) of 140—10 R. and this can be calculated by putting in the value of the residual shrinkage R as found.

In the case of nylon hose preboarded in steam the greater part of the stocking will not have been free to shrink but by contrast the nylon yarn in welt or top will have been free to shrink. Thus this yarn in the stocking top can be used in a test as described above to determine the temperature of pre-boarding.

Fluidised Beds in Dyeing

Progress in the use of fluidised-beds of sand and other substances existing in the form of discrete particles and kept in motion at a suitable high temperature by passing through them a hot gas (preferably air when oxidation is of no importance) for dyeing fabrics is disclosed in B.P. 814,526. It would appear that an essential advantage of this form of dyeing plant is that it allows temperatures over 100°C. to be employed but does not require the dyeing unit to be pressurised—operation of the plant is simple and convenient.

The present process is described with particular reference to dyeing fabrics of nylon, "Terylene" and acetate with disperse dyes. It consists of padding the fabric with a dye liquor containing a specially selected assistant in addition to the dye and then mangling out excess liquor and running the damp fabric through a fluidised bed of sand maintained at 195°C. by an upward current of hot air which has sufficient force to counterbalance the normal gravitational forces on the particles of sand so that these move freely relative to each other. By their contact with the moving fabric the hot sand particles maintain this at a uniform high temperature which dries the fabric and ensures fixation of a high proportion of the dye within the fibres.

In a typical dyeing procedure the dye padding liquor contained 10% of the disperse dye Duranol Red X3B 300 and a selected dyeing assistant (see Table 2). The padded fabric was then mangled and led through the fluidised bed of sand at a rate which allowed a contact between fabric and sand at 195°C of 10 secs. Thereafter, the fabric was hot soaped to remove loosely adhering dye, rinsed, and dried. The amounts of dye fixed in the fabric using different dyeing assistants are given in Table 2.

Table 2

% of Dye Assistant in Dye-padding Liquor	% Weight of Dye Present on Dyed: Continuous Filament "Terylene" fabric	Staple Fibre "Terylene" fabric
None	1·88	2·20
5% glycerine	2·49	2·71
3·3% ethylene glycol	2·15	2·29
7·6% hexamine	1·98	2·40
10·9% D-glucose monohydrate	2·44	2·42
4·1% ammonium thiocyanate	1·97	2·72
4·1% thiourea	2·28	2·41
3·3% urea	2·03	2·51
1·65% each of urea and ethylene glycol	2·05	2·35
2·1% thiourea + 1·65% ethylene glycol	2·32	2·38
2·5% glycerine + 2·15 thiourea	2·40	2·83

All the above-mentioned dyeing assistants promote a higher absorption of dye by the synthetic fibre but it is of importance to note that glycerine is most effective and it is easily washed out of the dyed fabric so that there is no opportunity for it to adversely influence the fastness to light of the colouring produced. The excellent effectiveness of glycerine (also of diacetin and triethanolamine) can be further illustrated by the data in Table 3 which apply to the dyeing of secondary and tri-acetate, also "Terylene" fibre goods.

The above data indicates that the dye assistants are much more effective with those fibres (tri-acetate and "Terylene") which are more hydrophobic.

Printing Black Patterns on Cotton Fabric

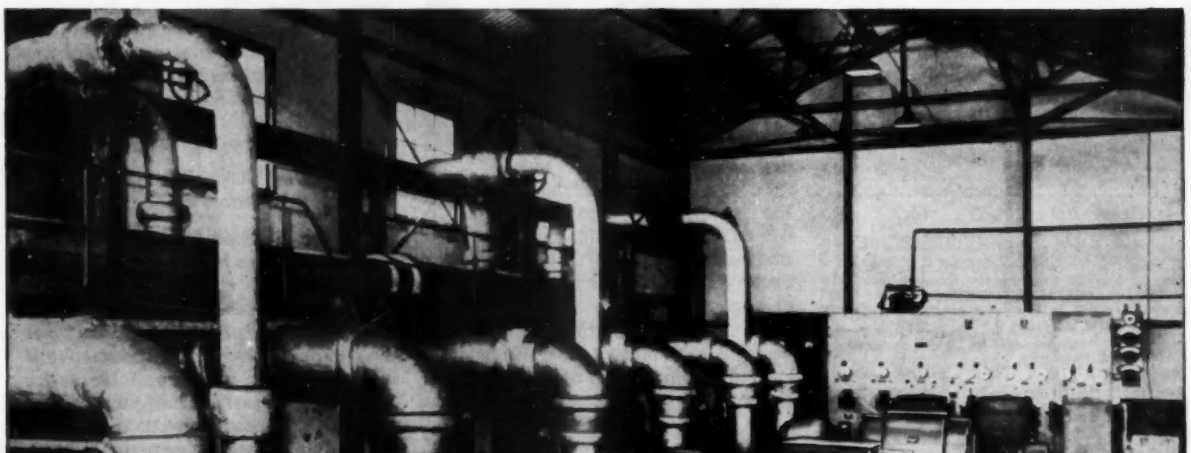
An early method for black printing cotton goods was based on the use of a printing paste containing an anti-diazo or a hydrazine-sulphonate of 4 : 4′-diaminodiphenylamine and a coupling component of the ice-colour series so that a black insoluble azoic dye was formed within the fibres during the subsequent steaming. Some difficulty has been experienced in operating such a process in order that reproducible results may be obtained. Hence the value of a recent German discovery (B.P. 812,143) that a surer method of obtaining level prints is to make use of a monoamine of the diphenylamine series, say 4′-methoxy-4-diphenylamine or para-aminodiphenylamine, and coupling this (after diazotisation) with a single coupling component particularly 1 : 3 : 5-tri-hydroxybenzene. This method allows neutral, alkaline or acid printing pastes to be used, and, although it is preferable to develop the black shade by an acid steaming treatment, this may be alkaline or neutral if desired. It would appear that it is somewhat unexpected that azoic dyes can thus be formed from anti-diazo- or hydrazinesulphonic acids and coupling components in acid steam. Obviously the possibility of printing under such a wide range of

Table 3

% of Dye Assistant in Dye-padding Liquor	% Weight of Dye Present on Dyed: Secondary acetate rayon	Tri-acetate	"Terylene"
None	1·19	0·55	0·31
5% Glycerine	1·50	1·33	1·27
5% Diacetin	1·46	1·16	0·95
5% Triethanolamine	1·28	1·21	1·11

The disperse dye used was Serisol Fast Red 3BL.

Geared Back-Pressure Turbines–



The three 1000 kW geared back-pressure turbine-generators installed at Reynolds Bros., Sezela, Natal, are, by providing electrical power in addition to process steam, performing a double duty in the sugar industry.

–cut your fuel costs

Great advantages can be gained by installing small back-pressure turbines for heating and process steam requirements in large factories. The back-pressure turbine is relatively cheap to install, occupies little space and requires only light foundations.

Please write for further details

ASSOCIATED ELECTRICAL INDUSTRIES LTD.

TURBINE-GENERATOR DIVISION

Incorporating the interests of M-V & BTH
WORKS AT MANCHESTER AND RUGBY, ENGLAND .

Manchester and Rugby
GLASGOW, SCOTLAND . LARNE, NORTHERN IRELAND

B4/ 702

pH conditions on either side of the neutral point extends the availability of this printing process to many different classes of dyes and allows it to be used on a wide variety of fibres sensitive to certain pH values.

The following is an example of a printing technique of this kind which uses 4′-methoxy-4-amino-diphenylamine as the base and 1 : 3 : 5-tri-hydroxybenzene as the coupling component.

In preparing the printing paste there is added to a solution of 15 grams of 1 : 3 : 5-tri-hydroxybenzene, 45 grams of a commercial powdered sodium 4′-methoxydiphenylamine-4-anti-diazo-sulphonate of 57% purity in 200 grams of water at 40°C., the following ingredients: 100 grams of a 50% aqueous solution of ammonium thiocyanate and 50 grams of a 33% aqueous solution of sodium chlorate. The resulting solution is then stirred into 500 grams of a neutral starch-tragacanth thickening and the whole made up to 1,000 grams by addition of 90 grams of cold water. (Instead of the ammonium thiocyanate solution it is permissible to use 25% acetic acid solution or 42% lactic acid solution.)

Bleached cotton fabric is printed with the above paste and dried. Thereafter the fabric is steamed for 8 to 10 mins. at about 100°C., rinsed in cold and then warm water, soaped at the boil with a liquor containing per litre 2 grams of the condensation product of methyltaurine with oleic acid and 1 gram of sodium carbonate, and again rinsed and dried. A deep black printed pattern is obtained. In the above printing process the 45 grams of the sodium 4′-methoxy-diphenylamine-4-anti-diazo-sulphonate may be replaced by 80 grams of sodium 4′-methoxydiphenylamine-4-hydrazine-sulphonate of 27% purity. It is also permissible to use sodium chlorite or sodium chromate instead of sodium chlorate.

New Testing Apparatus for Determining Crease-Resistance

The American Association of Textile Chemists and Colourists recently instructed the Committee for the Evaluation of Creasing Properties of Fabrics to investigate a new type of Stoll-Celanese wrinkle tester. This apparatus is quite different from other forms of testing apparatus based on a measurement of the crease-angle in a strip of fabric which has been pressed in a folded state and then allowed to relax on withdrawal of the pressure. According to a report (Amer. Dye. Rep., 1959, **48**, 56), the new test produced creases at random in the fabric under test rather than specifically across (at right angles) the warp or weft and so it is believed to approximate more closely to the manner in which a fabric or garment becomes crushed during actual use.

Essential features of the testing apparatus are shown in Fig. 7*a* and 7*b*. It comprises ten similar units which allow ten separate fabric samples to be tested at the one time under substantially identical conditions. Fig. 7*a* shows one unit consisting of an outer plastic glass cylinder *E* and an inner fixed circular flange *B* secured to a top air-tight cover *C*. One edge of a sheet of the fabric *A* is carefully wrapped around flange *B* so as to assume cylindrical shape at the start of the test. Then a rubber diaphragm *D* is drawn up to enclose completely the fabric *A*. The outer plastic cylinder can then be drawn up to enclose both fabric and rubber. Below the bottom of the rubber diaphragm *D* is a plunger *F* pressed upwards by spring *G*.

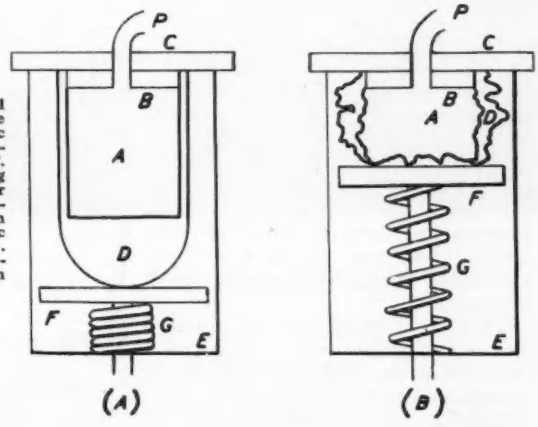
At the start of the test air is withdrawn from the diaphragm via pipe *P* thereby causing it to collapse and random wrinkle the fabric. At the same time spring *G* forces plunger *F* upwards to add to the compression on the rubber diaphragm and the enclosed wrinkled fabric as shown in Fig. 7*b*. After compression for 2 mins. air is pumped back to push the plunger *G* downwards and allow the fabric to relax from its compressed creased condition for 2 mins. This cycle of compression and relaxation is repeated eight or more times and it is to be noted that the same creases do not persist throughout the full number of cycles since with each relaxation and compression fresh creases are formed. The fabric is then withdrawn and carefully spread over an inclined flat surface within a suitably illuminated cabinet. Observers then view the fabric and grade as follows:—

(1) Wrinkle density (number of wrinkles per unit area).
(2) Profile of wrinkles (degree of distortion of fabric from a plane).
(3) Sharpness of creasing (roundness or knife-edge).
(4) Mussiness (proportion of fabric where the creases are so small and numerous as to make the fabric mussy).
(5) Randomness (an estimate of the degree to which a similar pattern exists throughout the entire specimen).

According to a scale of 0 to 4 (the higher the grade the worse the fabric appearance). Not all the above features are considered to be equal in their contribution to wrinkle resistance so they are appropriately weighted to a degree based on the judgment of the person conducting the test. The data in Table 4 indicates how a final assessment of the crease resistance of a beige-coloured resin-finished fabric was carried out:—

Although the test has been found to give satisfactory and consistent evaluations which agree with the behaviour of fabrics under actual wear conditions it suffers from the fact that the grading is subjective and depends on personal observation of the tested fabric. The problem therefore is to devise some method by which the grading can be made objective and to depend on some kind of actual measurement.

In America the Monsanto crease angle method of testing is largely used. It involves creasing a 4·0×1·5 cm. strip of the fabric under a dead load of 1·5 lbs. for 5 mins., removing the load, allowing the fabric to recover



Figs. 7a and 7b. Essential features of Stoll-Celanese wrinkle tester. (A) Fabric under test. (B) Flange integral with sealed top C. (C) Sealed top carrying flange B and holding outer plastic cylinder E. (D) Collapsible rubber diaphragm enclosing fabric A. (E) Plastic cylinder. (F) Plunger. (G) Spring to press F upwards. (P) Pipe to vacuum pump

freely from the creasing for 5 mins., and then reading the crease angle. An alternative Cyanamid crease angle recovery test is basically the same. Fig. 8 shows there is excellent correlation between the objective evaluations given by the Monsanto test and the subjective evaluations given by the new Stoll-Celanese test. Some investigations were made in which special attention was given to measuring the degree of creasing by the depth of the creases, i.e., the vertical displacement of the fabric around a crease from the plane of the fabric. It was found that this objective measurement alone cannot be used as a sole criterion of the degree of wrinkling.

Table 4

Criterion	Score	Weighting Factor	Weighted Score
Wrinkle density ..	2	× 2	4
Profile	1	× 5	5
Sharpness	2	× 3	6
Mussiness	1	× 3	3
Randomness	3	× 1	3
		Total weighted score +	21

Total weighted scores are classified as follows:—

Excellent	20
Good	21 — 27
Fair	28 — 35
Poor	36 — 45
Very poor	45

Dyeing "Acrilan" Acrylic Fibre

Burnthall (Chemstrand Corp.) recently gave a lecture in Chicago (Amer. Dye. Rep., 1959, **48**, 41) dealing with recent advances in dyeing "Acrilan." An important point, stressed at the commencement of the lecture, was that it was fundamentally wrong to think that the individual members of the acrylic group of synthetic fibres could all be dyed by much the same methods and dyes—each member required individual consideration.

An acrylic fibre such as "Orlon," which is composed 100% of polymerised acrylonitrile with no other added component has a relatively very small affinity for most dyes since polyacrylonitrile contains practically no really strong dye attractive groups within its molecule and the polyacrylonitrile chain molecules pack so closely together within a fibre that there is considerable hinderance to the movement of dye particles into and within such dense fibres. Most of the acrylic fibres are thus of a modified polyacrylonitrile type in which a relatively small proportion of a polymerising ingredient is copolymerised with the acrylonitrile so that the resulting copolymer fibres have either an increased affinity for dyes because of the presence of the dye-attractive added ingredient or because they are less dense on account of the looser fibre structure due to the presence of the added ingredient (which for this purpose need not be dye-attractive) and therefore more readily allow the entrance of dye particles into their fine structure.

Thus a vinylpyridine introduced into an acrylic fibre is basic and dye-attractive while vinyl acetate, methyl acrylate and methyl methacrylate are ingredients which are not dye-attractive but their presence causes the fibre structure to be looser. It is obvious that the dyeing process must be adapted to suit the particular acrylic fibre and the means by which it has been made more easily dyeable. "Acrilan" is a type of acrylic fibre whose easy dyeing properties are due to the presence of dye-attractive ingredients copolymerised with the acrylonitrile which is the main constituent of the fibre-forming polymer employed in the manufacture of "Acrilan."

"Orlon 42," "Acrilan," "Zefran," and "Creslan," all acrylic fibres, have markedly different dyeing properties and their colouration must therefore be appropriately considered. Burnthall states that differences between the dyeing properties of the different acrylic fibres can be greater than those known to exist between such different fibres as wool and nylon. "Acrilan" is amphoteric like wool and can be dyed with acid or basic dyes but the two fibres differ in that unlike wool, "Acrilan" possesses a much stronger affinity for basic dyes. The affinity of "Acrilan" for basic and acid wool dyes depends on the pH conditions of the dyebath. As the pH increases up to an upper limit of about 8 "Acrilan" shows an increasing affinity for basic dyes while at the same time its affinity for acid wool dyes decreases.

Considerable progress has recently been made in making available new basic dyes (frequently termed cationic) and many have been found readily applicable to "Acrilan." For this reason it became necessary to devise the most satisfactory dyeing methods, i.e., those capable of giving excellent absorption within reasonably short dyeing periods. In research carried out it was first established that dye absorption with most basic or cationic dyes was assisted by raising the dye liquor from pH5 to 8 but the pH effect on some dyes was greater than on others. It became apparent that it would be useful to have in the dye liquor a substance which could cause the pH of the liquor to change progressively over the range 5 to 8 thus allowing all dyes present to be at their optimum dyeing pH for at least part of the dyeing period.

Ammonium acetate proved reasonably useful for this purpose but it was discovered that urea could be much more effective. In dyeing with urea present in the dye liquor the pH was found to rise steadily from 5·5 to 7·0 during the normal dyeing period and, in general, the colour yield was frequently 30 to 40% higher than that obtained with ammonium acetate under comparable conditions. The relative effects of urea and ammonium acetate on the dyeing of "Acrilan" with the cationic dye Basic Blue 21 is shown by the dye absorption curves in Fig. 9. It is seen that from the commencement of dyeing the presence of urea promotes a higher rate of dye absorption than does ammonium acetate and that at the end of dyeing for 2 hours nearly twice as much of the blue dye is absorbed when urea rather than ammonium acetate is present.

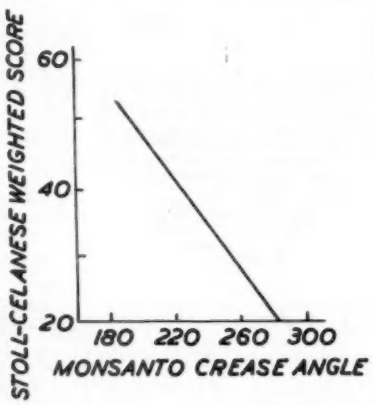


Fig. 8. Curve showing linear relationship between the Monsanto crease recovery angle and the Stoll-Celanese weighted score assessment values of the crease resistance of a resin finished fabric

(*continued on page 427*)

X15

Versatile PROCIONS®—*the original fibre-reactive dyes*

Ideal for swim wear,
Procions give brilliant shades of good light- and wet-fastness. Selected Procions are fast to chlorinated water.
DYE by all processes from simple, cold, batchwise to continuous high speed.
PRINT by very simple processes.

Ⓟ *Patented in the main industrial countries.*

Full information on request ICI IMPERIAL CHEMICAL INDUSTRIES LIMITED LONDON SWI ENGLAND

Lighting-1

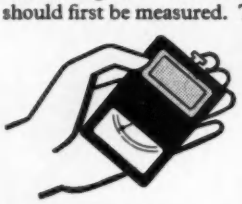
Good lighting affects productivity in three ways, (1) by directly increasing the speed of working and reducing errors and wastage, (2) by improving overall factory efficiency through better supervision and housekeeping, (3) by providing better working conditions, thus improving labour relations and avoiding frequent changes of workpeople.

It is not possible to judge by the eye alone whether the lighting in any factory is good enough to serve these purposes because the eye has a tremendous range of adaptation (vision of some kind is possible within an illumination range of 1,000,000 to 1) and is hence an unreliable measuring instrument. Severe mental and eye strain or unconscious slackening of working speed may occur under lighting which *appears* to be adequate.

The only reliable way to appraise factory lighting is to conduct a lighting survey using a lightmeter, an inexpensive instrument which measures the actual illumination available. These figures can then be compared with official recommended values for the various tasks.

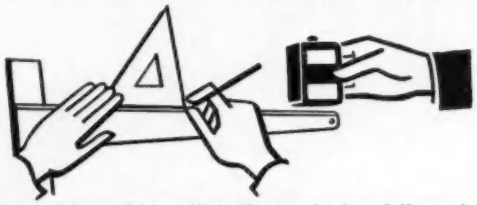
Lighting Survey

A methodically conducted lighting survey is the first step towards achieving good productive lighting. The average artificial illumination at working height should first be measured. This requires a number of readings at various positions relative to the lighting fittings, particularly beneath and between fittings and by the wall. The average of the readings should then be compared with the illumination values recommended by the Illuminating Engineering Society. The following is a general guide to illumination requirements.



NATURE OF WORK, PROCESS OR MATERIAL	ILLUMINATION LUMENS/SQ.FT.
Rough or routine work. Large detail. Medium to light material of good contrast.	7
As above, but work rather more skilled or critical.	10
Ordinary work usually involving workers' inspection. Medium detail and contrast.	15
Fairly critical work, fairly small detail or poor contrast.	20
Skilled work, small detail or dark material.	30
Fine or critical work, very small detail, very poor contrast or very dark material.	50
Very fine exacting work.	100
Minute work.	200

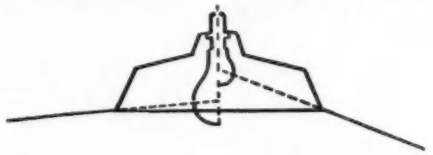
In addition, readings should be taken at selected working points with the lightmeter so placed that it measures the light on the work while the operative



is working. This will indicate whether full use is being made of the light or whether shadow is obscuring part of it.

Glare

Any direct light on the eye tends to reduce its sensitivity—thus reducing the power to see. Increasing the intensity of the light source may



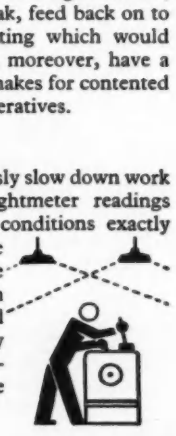
therefore not improve matters unless care is taken to avoid glare either by correct positioning or by the use of correctly matched reflectors and lamps.

Walls and Ceilings

Certain surfaces and certain colours absorb light and therefore do not make the best of a light source; others reflect light and, so to speak, feed back on to the work a portion of the lighting which would otherwise be lost. Bright walls, moreover, have a good psychological effect which makes for contented —and therefore productive—operatives.

Shadows

Unnecessary shadows may seriously slow down work and also cause accidents. Lightmeter readings should always be taken under conditions exactly similar to those obtaining while work is going on. The operative himself may mask his work, an overhead crane or a heavily loaded conveyor belt may periodically obscure a light fitting, or a dust-laden atmosphere may reduce the designed lighting values.



For further information, get in touch with your Electricity Board or write direct to the Electrical Development Association, 2 Savoy Hill, London, W.C.2. Telephone : TEMple Bar 9434.

Excellent reference books are available on electricity and productivity (8/6 each or 9/- post free)—"Lighting in Industry" is an example.

E.D.A. also have available on free loan in the United Kingdom a series of films on the industrial uses of electricity including one on industrial lighting. Ask for a catalogue.

R.S.A. Cantor Lecture

Research in Cotton†

A review of developments in opening and cleaning, spinning, sizing, weaving and finishing techniques

By J. J. VINCENT, M.SC., F.T.I.*

COTTON is the world's most important industrial fibre, whether its importance be measured by the weight of fibre produced or by its value, as shown in Table 1.

Table 1

Estimated Total World Production of Industrial Fibres 1956-7

Fibre	Weight (10⁶lb.)	Approx. av. price in U.K. in pence per lb.	Approx. value (10⁶£)
Cotton	188	26	20
Wool	29	90	11
Rayon filament yarn	22	60	6
Man-made fibres (non-rayon) ..	7	120	4
Flax	32	30	4
Rayon staple ..	30	24	3
Silk	1	400	2
Jute	40	10	2
Hemp	26	8	1
Total ..	374	—	53

Opening and Cleaning

The opening machines in general use were evolved by trial and error. If a spinner wished to clean cotton more thoroughly he merely added another opener to his line, a practice which was later shown to be very inefficient by Shorter, Williams and Peirce at the Shirley Institute. They showed, as the result of surveys carried out in mills and aerodynamic studies in the laboratory, that the cotton should be opened up progressively into smaller and smaller tufts if the cleaning were to be improved. The results have been applied industrially in the Shirley (Tweedales) opener, a machine of greatly improved cleaning capacity which replaces several of the older, less efficient machines previously employed in tandem. The principle underlying it is also applied in the Shirley Analyser, an instrument for separating into its components a sample containing both good fibre and trash. The sample, which may consist of lumps from a bale or the material rejected by an opening machine, is fed to the analyser where small tufts are detached and carried into an air-stream. The paths of the lint and trash diverge, so enabling the two components to be collected separately and weighed.

Spinning

Roller-drafting has been the subject of much research, directed mainly to explaining the variability in linear density that arises and finding ways to minimise it. Balls was early in the field with his discovery of the *drafting-wave*. More recent studies of the properties of the drafting-wave have been made by Foster. More important is the appreciation that apparently insignificant machinery imperfections may lead to serious irregularity in the yarn. These imperfections are of three main kinds: (*a*) the position of the roller nip may vary; (*b*) the rollers may not run at steady speeds; (*c*) top rollers may slip. Variation in the position of the nip has been investigated by Gregory and Tyson and has been shown to be due mainly to eccentricity of the rollers; that is, their geometrical axes do not coincide with the axes about which they are rotating. An eccentricity of no more than two-thousandths of an inch may in certain circumstances be undesirable.

Variable speed of rotation may arise from defects in the gearing, such as incorrect tooth profile or eccentric mounting of wheels, or to torsional vibration. These aspects of the problem have been investigated by Gregory. Torsional vibration, however, still gives trouble and no sure method of avoiding it completely has yet been found. The causes and consequences of roller slip, which occurs mainly at the drawframe, have been described by Dakin, Foster and Locke.

One aspect of ring-spinning that has received considerable attention from research workers is the shape of and the tension in the rotating length of yarn (the "balloon") that lies between the thread-guide and the traveller. Early work was done by Balls, whose suggestions for a spinning-frame combining some features of the mule with some of the ring-frame led later to the Gwaltney ringframe. An important theoretical contribution was made by Grishin in Russia in 1934, but the information was not generally available until 1956. Meanwhile theoretical and experimental investigations were undertaken by Mack, Gregory and Smart at the Shirley Institute and by others. The resulting information has led to improved balloon control and facilitated the introduction of frames spinning much larger bobbins than hitherto.

Sizing

With few exceptions, cotton warps cannot be woven without first being sized: an unsized warp would rapidly become a tangle of broken yarn. Pioneer work was undertaken by Farrow and his co-workers, particularly into the properties of starch films and starch pastes, starch being the most important adhesive for sizing cotton. The design of weaving experiments to reduce errors to a minimum was investigated by Main and Tippett, Bradbury and Hacking. It is now possible to specify for each kind of warp what ingredients should be present in the size mixing and in what proportions, how much should be added, and how to add the desired amount with certainty, in order to achieve the minimum warp breakage rate.

The factors determining the amount of size taken up by the warp during sizing—viscosity and concentration of the size liquor, squeeze-roller pressure, and so on—proved to be numerous and not all readily controllable, so that in practice wide deviations from the target still occurred. This difficulty was overcome in a neat way by Jones and Shorter with their invention of the Shirley automatic size box, a device which enables a predetermined weight of size to be applied to a warp irrespective of variations in the properties of the size liquor, or those of the yarn or of the machine characteristics.

Weaving

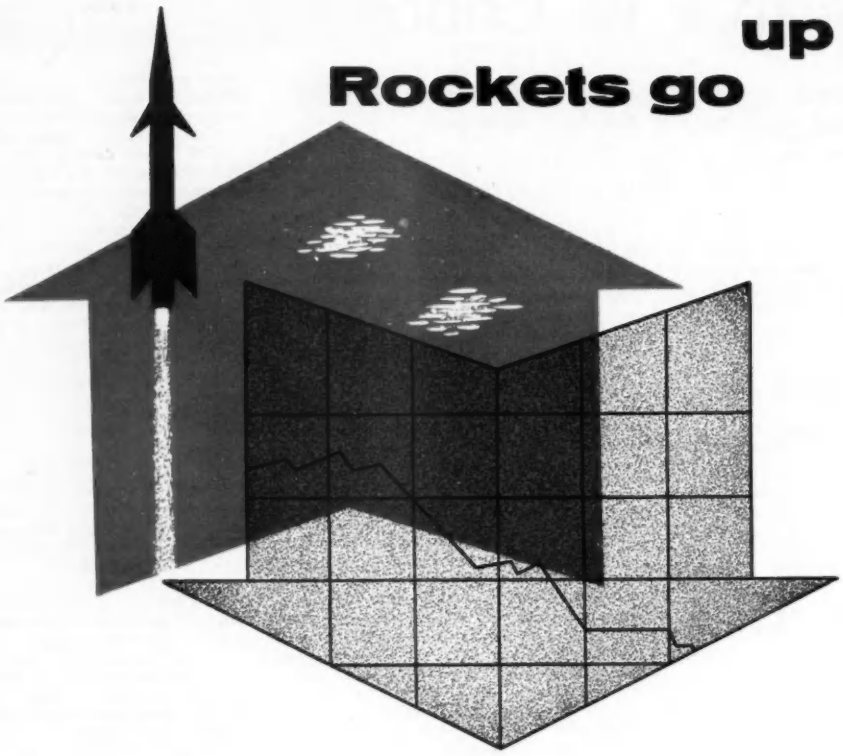
Since the conventional cotton loom, employing a shuttle for inserting the weft, was made completely automatic at the end of the last century it has undergone no major development. Research on it has been largely directed towards a better understanding of its behaviour and the effect of machinery imperfections on cloth quality. Shuttle projection in particular poses special problems, since the shuttle is not a machine element as ordinarily understood by engineers. Much work on this problem has been done at the Shirley Institute and progress has been made in two main directions: in providing simple devices suitable for use in a weaving-shed, for controlling the speed, acceleration and retardation of the shuttle and in placing the design of picking-cans on a rational basis. The Shirley shuttle speedometer is a good example of the kind of robust instrument necessary for use in the mill.

The advantages of drawing the weft from a large stationary package of yarn, instead of a small package contained in a shuttle, have long been recognised, but attempts to apply the method in cotton weaving on a commercial scale have been unsuccessful until quite recently. Now the Sulzer weaving machine appears to have established itself in certain fields. It employs a small dummy shuttle to grip the weft and carry it across the warp, the weft being then severed at the supply side and the cut ends tucked into each selvedge alongside the next length of weft. This loom, placed upon the U.S. market in 1952 and the European market some years later, has a long history of development going back to Rossmann's original conception in Germany in 1924. One fundamental problem with all shuttleless looms is the production of satisfactory selvedges and it is the careful attention paid to this point as much as any other feature that has led to success where others had failed.

A more revolutionary type of shuttleless loom has been developed, first in Sweden by Pääbo and later in Czechoslovakia by Svaty, in which the weft is projected by an air-jet. These looms are still experimental though there are one or two small industrial installations for special purposes. The

† *Abstract of a Cantor Lecture given recently to the Royal Society of Arts.*

* *Professor of Textile Technology, Manchester College of Science and Technology.*



Rockets go up

Bleaching costs come down

A vital power force for rockets...a safe bleaching agent for all fibres. These are only two of the many applications for Laporte hydrogen peroxide. Increased production is meeting this growing demand and helping to lower your bleaching costs by supplying you with hydrogen peroxide at greatly reduced prices. Laporte Textile Technical Service Department will be pleased to give advice on individual bleaching problems.

with

LAPORTE HYDROGEN PEROXIDE

Laporte Chemicals Ltd., Luton. *Telephone: Luton 4390*

L I L
A MEMBER OF THE LAPORTE GROUP OF COMPANIES

54

significance of this development is that nothing tangible is projected between the sheets of warp except the necessary length of weft, and as this length of weft weighs only about one ten-thousandth of the weight of a normal shuttle the way is open for achieving much higher loom speeds. Research on this and related methods of weft insertion is being undertaken at the Manchester College of Science and Technology.

Finishing

Broadly speaking, much of the research has been directed to removing the inadequacies that cotton has relative to some other fibre and a large number of chemical and mechanical treatments have been evolved. An early example is the crease-resist finish invented by Tootal, Broadhurst Lee's Research Department about 1927, the forerunner of the many resin treatments applied today. As an example of a mechanical finishing treatment we may take compressive shrinkage, which has been widely adopted for such material as cotton shirting, where subsequent shrinkage is undesirable.

Other successful lines of research relate to process control. As examples may be cited the work of Clibbens and his collaborators on the effect of pH in the bleaching of cotton by hypochlorite and the use of the fluidity of solutions of cotton in cuprammonium hydroxide as an indication of chemical degradation during bleaching or any other process. The latter test has proved of great value over a very wide field. The test was originally developed between 1911 and 1920 in connection with the manufacture of explosives from cellulose. In 1923 Farrow and Neale, as a result of their investigations, suggested "that bleachers and dyers would find in viscosity determinations a very sensitive means of controlling tendering by the chemical treatments they employ." The method was further investigated and elaborated in great detail by Clibbens and his co-workers, eventually being adopted as a standard test throughout the world.

R.S.A. Cantor Lecture

Research in Man-Made† Fibres

The highest tenacities so far reached for any fibre still fall far short of the tenacities calculated from the forces required to rupture the covalent bonds of the main chains

By J. R. WHINFIELD, C.B.E., M.A., F.R.I.C., F.T.I.*

WHEN fibres emerge from the holes of a spinneret there is some transient point covering the first few micro-seconds of their existence—a point which we might roughly describe as representing a state somewhere between liquefaction and solidity—at which effective stretching is possible. This has long been realised, but full recognition of what can be accomplished in this way has come only rather slowly. With viscose rayon this led first to great improvements in the strength and certain other qualities of the yarn which about 10 years ago enabled this fibre almost completely to replace cotton in the manufacture of tyre cords. Within the past few years these improvements have continued and this gives point to a statement made by A. H. Wilson in 1953 to the effect that "the technology of viscose manufacture has once again become fluid." The following quotation from a recent publication will serve as an illustration of this forward movement. "Perhaps the most important factor leading to development of the improved technology is the recognition that certain chemicals added to viscose serve to stabilise xanthate decomposition thereby prolonging the period when effective stretching may be applied." What is in fact achieved is a particular degree of orientation of the chain molecules not merely near the surface but throughout the fibre, and it is to this that the improvement in properties must be ascribed. It is perhaps unnecessary to say that such improvement entails an increase in the cost of production of a fibre which owes much of its success in the past to its relatively low price. The extent to which this advanced technology will be adopted throughout the industry as a whole therefore remains an open question.

With fibres such as nylon and "Terylene" a new set of circumstances arises. These fibres are produced, not by the extrusion of polymer solutions but of polymer in the molten state, and solidification results from the cooling of the melt. Even so, there exists that critical point at which stretching may be applied by drawing off the fibres at a higher rate than that at which they are extruded, and in this way we can control the degree of molecular orientation. With nylon, crystallites make their appearance at this stage, but with "Terylene," the transition point is higher and the filaments are devoid of actual crystallinity. However, in both cases the filaments are susceptible to further stretching and this constitutes a separate operation commonly referred to as cold-drawing. The so-called draw ratio is the ratio between the length of the filaments before and after the application of this further process and is subject to considerable variation according to the conditions employed. But cold drawing remains a particular case of stretching resulting in a fibre in which amorphous and crystalline regions co-exist. This is now accepted as a general feature of the molecular architecture of fibres which to a very large extent governs their physical properties.

The avowed object of the work of Staudinger and his collaborators had been to seek an understanding of the molecular architecture of natural polymers among which cellulose was but one. But Staudinger believed that this might be achieved more readily by first making a study of some less complex polymeric substances which could be obtained by actual synthesis from monomers. Beginning with the polyoxymethanes derived from formaldehyde, he later extended his ideas to various polymers formed by the self-addition of unsaturated compounds such, for example, as vinyl acetate and styrene. The existence of such polymers was already known and a number of them had in fact been known for a long time. The properties and behaviour of them all were soon shown to be in accordance with the general macromolecular theory. If by then this theory was thought to be in need of further confirmation—and there were, of course, those who felt this to be the case—all doubts were finally set at rest by the work of Carothers which he began in 1928, and which during the course of the next few years was to lead him directly to the discovery of nylon. Not that Carothers himself was much concerned with obtaining further proof of the theory: from the first he was content to accept it and he set out to pursue its consequences in a particular direction which up to that point had largely escaped notice. In his own words his aim was "to synthesise giant molecules by strictly rational methods," and this aim could not even have been conceived except in terms of macromolecular theory.

The practical achievement of Carothers was to establish a new method for the synthesis of linear high polymers based on intermolecular reactions of bifunctional compounds and thus ultimately on the ordinary condensation reactions of classical organic chemistry. Despite the power and the generality of this method only two classes of condensation polymers have so far been found of value as a source of fibres, although many have at various times been examined from this point of view. These two classes are the aliphatic polyamides which are due to Carothers himself, and the aromatic polyesters, which Dr. Dickson and I first described in 1941.

Practical considerations largely restrict the choice. A capacity to yield oriented fibres was first demonstrated by Carothers in the case of certain aliphatic polyesters but these were of no value if only because

† *Abstract from a Cantor Lecture given recently to the Royal Society of Arts.*
* *Imperial Chemical Industries Ltd.*

aliphatic polyesters of this class have low melting points.

Polymeric ethylene adipate is a typical aliphatic polyester. It can be obtained in a condition of high molecular weight by heating together ethylene glycol and adipic acid and removing the water formed from the sphere of the reaction. It is built up from the recurring unit

$$\ldots -OC(CH_2)_4-CO-(CH_2)_2-O\ldots$$

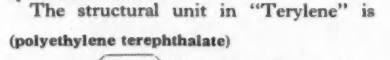
When molten it is extremely viscous and the melt can be extruded through a spinneret to form filaments which can then be cold drawn to yield oriented microcrystalline fibres of considerable strength and pliability. Unfortunately these fibres melt at a temperature of a little above 50°C., and no member of this series of aliphatic polyesters has a melting point much above 100°C.

It was this circumstance that led Carothers to turn his attention to the analogous polyamides which he found to have a similar capacity to yield oriented fibres but which also possessed a very much higher range of melting points—for the most part well above 200°C. This was a singularly happy discovery, and naturally one of the greatest practical importance, but in a sense a mere incident in his long series of researches. Comparing the polyamides with the polyesters Carothers was content to say "The difference lies in the direction required by the much higher molecular cohesions of amides as compared with esters," and to leave it at that.

The discovery of "Terylene" a few years ago (1941) was to reopen the whole question of the melting point of high polymers and to unleash a flood of theoretical speculations and ideas on this and on other questions besides.

The structural unit in "Terylene" is

(polyethylene terephthalate)



and if this is compared with the structural unit of polyethylene adipate, it is at once seen that the difference lies in the replacement of the flexible chain of 4 methylene groups in the latter by the very rigid aromatic nucleus. The effect of this on melting point proved to be dramatic—an increase of over 200°C. Curiously enough, the melting point of "Terylene" turned out to be within a few degrees of that of nylon 66 derived from adipic acid and hexamethylene diamine where the structural unit is

$$\ldots -OC(CH_2)_{44}-CO-NH(CH_2)_6NH-\ldots$$

However, the mere inclusion of the aromatic nucleus in the repeating segments of the chain is not in itself sufficient to yield polymers of high melting point or indeed polymers capable of yielding oriented fibres. These properties result from the symmetrical disposition of the carbonyl groups in the para position, and it was from a consideration of the relations between molecular symmetry, crystallinity, and fibre forming capacity that "Terylene" itself came to be discovered. The corresponding polyesters derived from o-phthalic acid were already known in 1941 and these were all low-melting solids which could not be induced to crystallise or to yield fibres.

In addition to the aliphatic polyamides and the aromatic polyesters there is a third class of synthetic fibres which has achieved great importance—the so-called acrylic fibres. These stem from polyacrylonitrile or copolymers of acrylonitrile and other vinyl monomers. Polyacrylonitrile had long been known and was among the few addition polymers possessing a high melting point. But since melting is accompanied by decomposition, the technique of melt spinning was out of the question. Everything therefore depended in the first instance on whether polyacrylonitrile (or its copolymers) could be brought into solution. This was eventually achieved by means of a few unusual solvents dimethyl formamide being among the first of these to be found. Once solution had been accomplished the way lay open and acrylic fibres are now produced both by dry and wet spinning.

R.S.A. Cantor Lecture

Research in Wool†

Any refusal to blend man-made fibres with wool cannot be justified unless the performance of all-wool fabrics can be modified at will to meet particular needs

By J. B. SPEAKMAN, D.SC., F.R.I.C., F.T.I.*

SYSTEMATIC scientific study of the materials and processes of the wool textile industry began about 40 years ago. At first, progress was slow because attempts to characterise wool keratin by elementary analysis were frustrated by baffling variations in composition. Chief attention was given to the sulphur content, which was found to vary, not only from wool to wool, but also along the length of a single staple. In addition, the cuticular and cortical cells were found to have a higher sulphur content than the intercellular phase, while the medullary cells when present, were almost devoid of sulphur. It was only when attention was transferred from elementary to amino-acid analysis that it became possible to postulate a skeleton structure which, besides being characteristic of all wools, was capable of accommodating the variations in composition. According to this simplified view, the fibre consists of long polypeptide chains, which are arranged roughly parallel to the length of the fibre and are linked together by cystine and salt linkages, the latter being derived from acidic (aspartic and glutamic acid) and basic (arginine and lysine) side-chains. The cross-linking was believed to be two-dimensional, and cohesion between the "grids" was attributed to van der Waals forces and hydrogen bonds.

Unfortunately, little is known about the distribution of amino-acids along the length of the polypeptide chains, and attempts to modify the properties of wool by cross-linking reactions have been greatly handicapped for lack of this knowledge. Important information was, however, obtained by Consden, Gordon and Martin in their study of the acidic peptides obtained by the partial acid hydrolysis of wool. Among the dipeptides was a heavy preponderance of glutamylglutamic acid, and this fact, together with the identification of many other polar-polar dipeptides, was sufficient to invalidate Astbury and Bell's conception of the nature of α-keratin, according to which polar and non-polar side-chains should alternate along the folded polypeptide chains. The need for any such limitation on the arrangement of the amino-acid residues disappeared with Pauling and Corey's suggestion that the chains are spiral in form, with 3·7 amino-acid residues per turn, each residue being hydrogen-bonded to the third from it in each direction along the chain.

Technical Developments

Yarn Manufacture.—The "tow-to-top" systems of processing man-made fibres, in which an assembly of continuous filaments is converted directly into top in a single cutting operation, offers a striking contrast to the lengthy series of processes in the worsted industry: scouring, carding, backwashing, gilling (twice), combing, and gilling (twice). Even simpler is the Perlok system of converting continuous filament yarn directly into a staple fibre yarn, and shortened methods of processing natural fibres which begin their existence as staple fibre will have to be evolved if such natural fibres are not to suffer always from the disadvantage of higher costs of processing. A solution to the problem is of much greater importance to the worsted industry than to the cotton industry, and it is, therefore, encouraging that there has been a renaissance of inventiveness in the worsted industry since the end of the Second World War. The autoleveller developed by Mr. G. F. Raper and the Superdraft system of spinning invented by Air Vice-Marshal G. Ambler have been combined to give a shortened system of worsted drawing and spinning. Both inventions came from within the industry, and although the new system does not bring exclusive benefit to wool—it can, of course, be used with all types of fibre—the development is important in relation to the main problem which has still to be faced, because the long-established systems

* *Professor of Textile Industries, University of Leeds*

† *Abstract of a Cantor Lecture given recently to the Royal Society of Arts.*

have in one section of the field at least been challenged and overthrown.

Finishing.—Among new developments are the methods of imparting permanent creases and pleats to all-wool fabrics. The evolution of these processes was prompted by the fact that fabrics made from blends of "Terylene" staple fibre and wool (55 : 45) can be given creases or pleats which are resistant to both dry-cleaning and washing by simple treatment with superheated steam. When, however, an all-wool fabric is formed into pleats between pleating papers and steamed for 20 minutes at atmospheric pressure, as is customary, the pleats disappear during dry-cleaning and even more quickly during washing. Similarly, the creases imparted to all-wool trousers during pressing in the Hoffman press are not resistant to either dry-cleaning or washing. It is, however, known that reagents such as alkalis, sulphites and bisulphites act as powerful assistants in setting processes, and simple methods of using them to obtain permanent creases and pleats in all-wool fabrics have been evolved. The most successful is one in which the manufacturer treats the fabric with a 2% solution of sodium bisulphite for 15 mins. at room temperature. At the end of this time, excess bisulphite is removed by rinsing, and the fabric is then centrifuged and dried at a low temperature. The process can be combined with London Shrinking, and the dried fabric is finally pressed between press papers. To obtain permanent creases with the treated fabric the tailor has merely to steam in the Hoffman press in the usual way, preferably with the fabric between damp cloths.

An illustration of the success of the process is afforded by the data of Table 1, which were obtained with one of the more difficult types of fabric, a 16-oz. Scotch tweed. Several samples were treated with bisulphite solutions of different concentrations, followed by rinsing and drying under the conditions already outlined. Strips of the fabric were then folded and steamed for various times, with and without the addition of water, in the Hoffman press. Each strip was afterwards soaked for 3 hours in a solution of Teepol (0·3%), rinsed, and then allowed to dry freely while held by one edge. Finally, the angle of the residual crease was measured with the Shirley crease-resistance tester.

Table 1

Time of Pressing (secs.)	Angle of Crease of Samples Treated with Bisulphite Solutions of the Following Concentrations					
	Untreated	1%	2%	3%	4%	5%
5 (dry) ..	—	119	110	110	106	106
15 (dry) ..	—	117	109	108	104	103
15 (wet) ..	130	92	95	94	90	93
60 (dry) ..	—	99	100	99	101	98
60 (wet) ..	120	84	87	88	89	90

Under all conditions the bisulphite-treated fabrics give much sharper creases than the untreated, and if the fabrics are dried at room temperature after treatment with sodium bisulphite, the concentration of the solution need not be more than 1%. When drying is carried out in a tentering machine at a temperature which must be below 80°C., the concentration should be higher (2%), for reasons which will be apparent from the nature of the setting reactions.

When wool is treated with sodium bisulphite solution, disulphide bond breakdown takes place as follows:—

$$R\text{-}S\text{-}S\text{-}R + NaHSO_3 \longrightarrow R.SH + R.S.SO_3Na$$

Although there is some reversal of the reaction during rinsing, much of the bisulphite remains in combination with broken disulphide bonds. When, however, the fabric is steamed in the Hoffman press, disulphide bonds are re-formed, and the liberated bisulphite (or sulphur dioxide) is free to break and remake other disulphide bonds elsewhere in the structure. But since the complete process of disulphide bond breakdown and rebuilding takes place with the fabric creased, the crease is made permanent. It seems clear that better results are obtained with wet fabric than with air-dry fabric because the presence of water not only facilitates relaxation by hydrogen-bond breakdown but also promotes migration of sodium bisulphite and sulphur dioxide through the structure.

In the alternative process which has been developed in Australia, the fabric is sprayed with a solution of ammonium thioglycollate by the tailor himself, formed into creases, and then steamed for 15-20 secs. in the Hoffman press. The mechanism of the reaction is similar to that with bisulphite, viz. disulphide bond breakdown and rebuilding

$$R\text{-}S\text{-}S\text{-}R + HS.CH_2COONH_4 \longleftrightarrow R.SH + R.S.S.CH_2COONH_4$$

and a 1% solution of sodium (or other) bisulphite can be used in place of ammonium thioglycollate.

Treatment with bisulphite, followed by rinsing, can likewise be used to give permanence to the embossed effect imparted to cut and uncut pile fabrics by steaming in contact with a patterned matrix. Setting reactions generally have also been developed recently to give a high permanent lustre to all-wool fabrics. In one process, the fabric is impregnated with a 1% solution of sodium bisulphite in a mixture of equal parts of ethylene glycol and water. When the fabric is afterwards pressed in contact with a heated polished metal surface, the high lustre obtained is not removed in water or steam because the fibres in the smoothed surface have been set permanently in their deformed shapes.

Progress in finishing of wool textile materials is not, however, confined to the many applications of setting reactions. Resin finishes are finding commercial application, one of the more recent being the oil- and grease-resistant finish imparted to fabrics, such as the all-wool gaberdine, by means of fluorine-containing resins.

Dyeing and Finishing

(*continued from page 423*)

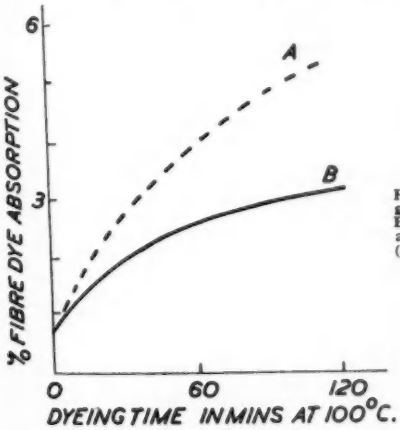


Fig. 9. Curves showing the progressive absorption of CI Basic Blue 21 by "Acrilan" during dyeing at 100°C. with (A) urea and (B) ammonium acetate present in the dye liquor

Table 5

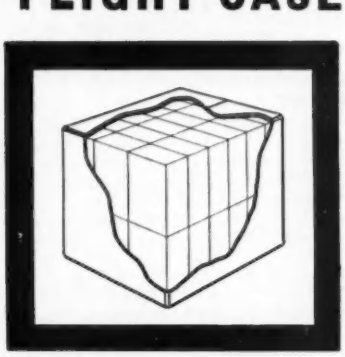
Dyeing	Increase in Dyeing Rate obtained by Using Urea Instead of Ammonium Acetate
1% Astrazon Yellow 7GLL..	82%
1% Sevron Yellow 3RL	89%
2% Sevron Red L	57%
2% Sevron Red GL	186%
2% CI Basic Blue 22	102%
2% CI Basic Blue 21	160%
5% Sevron Yellow 3RL	235%
10% CI Basic Blue 21	242%

It seemed possible at this stage that the addition to the dye bath of some other dye auxiliary product might give added assistance to dye absorption and preliminary experiments indicated that this substance ought to be of the non-ionic type although the anionic auxiliary Igepon T has been shown to be helpful. Subsequently it was found that the dyebath ought to be prepared with 3% of urea and 0·5% of Igepal CO 170 (non-ionic).

The "Acrilan" material should be entered with the dyebath at 120°F. After 10 mins. the liquor should be raised to the boil (205°F. and over) and dyeing continued for a further 60 mins. when dyeing should be complete if the colour pattern has been matched. By this method "Acrilan" can be dyed more cheaply and expeditiously than hitherto possible. The use of urea and Igepal CO 710 does not lead to dyeings having impaired fastness properties.

A number of cationic dyes were applied by comparable methods using urea and ammonium acetate as dyeing assistants and the dyeing rates were determined. The data in Table 5 shows how urea promotes more rapid dyeing. These differences in dyeing rates are striking.

TOP FLIGHT CASES



First produced fifty years ago, but as modern as modern methods can make them, "FIBERITE" Cases show that only by attention to every detail can fibreboard packing become "FIBERITE" packing.

Travel in this space age is a commonplace. Busy executives do it, holidaymakers do it, "FIBERITE" Cases do it — millions upon millions of them every year — packed with the products of British industry and agriculture.

Passengers are able to take care of themselves, but goods need the sure and sturdy protection of "FIBERITE" packing. The hazards of travel may vary with distance yet whether the journey is half way round the world or to the next town "FIBERITE" Cases have the in-built quality to see the goods to their destination safe and sound.

Quality • Economy • Service • Strength • Design

REGISTERED FIBERITE TRADE MARK PACKING CASES

'FIBERITE' PACKING CASES

Are made only by **THAMES BOARD MILLS LIMITED,** *Purfleet, Essex and Warrington, Lancs.*

The word "Fiberite" is a registered trade mark

TBF3-8056-65

Textile Trade and Prospects

Linen Trade Review

Manufacturers and merchants have every reason to be satisfied with the tempo of business during autumn which, to date, has ensured cover for spindles and looms until well into the turn of the year. Present prices of linens are keenly competitive with rivals in the range of household textiles, while originality in design and construction, combined with the application of modern finishing techniques, have again brought linen to the front as a fashion fabric.

The trade generally has maintained a conservative attitude towards modern trends in manufacture, with consequences too plainly evident by the growing casualty list of recent years. It has been pointed out that in this respect it has been no less fortunate than the cotton trade, but while the latter has suffered principally from the rapid development of manufacturing capacity overseas, the world total of linen spindles and looms has shown a progressive decline.

Analysis of current achievement by survivors, and consideration of findings on the casualties provides clear evidence that much of the capital expenditure on re-equipment was not planned to best advantage, being based on current demand with little or no consideration of possible future trends. This has been due in no small measure to the conservative outlook still prevalent in the trade, individual concerns showing little inclination to pool their experience for the common good.

The problem of cost reduction is common to all and is closely related to the fundamental one of raw material sources and supplies. The increasing demand for quality grades and the progressive decline in the quantity of these on offer has created a gap which will not be easily bridged. This problem demands an early solution to ensure continuity of supply of a range of end products which offer a comfortable profit margin. Whether this is effected through closer co-operation between grower and spinner, or by modification of established manufacturing practice to extend the spinning range of the fibre now available is immaterial; both are practicable. In view of the absence of established channels through which the first mentioned could be negotiated, and the time required to make the necessary supplies of high grade fibre available the alternative offers the most feasible solution, and provides the manufacturer with a solution to other problems relative to the economic use of modern equipment.

The fact that man-made fibre products represent an increasing percentage of the total loom output—of which only about 50% is now estimated to be all linen—and that a substantial quantity of the component yarns is provided by the spinning section, has established the adaptability of existing plant and manufacturing practice to the processing requirements of the newer fibres. Chemstrand Co.'s synthetic fibre plant at Coleraine, now in production, and the proposed I.C.I. "Terylene" factory at Kilroot will provide N. Ireland linen manufacturers with opportunities for diversification, which could utilise their full productive capacity with modest capital expenditure on modification.

Favourable weather conditions in West European flax production areas have permitted an extension of the retting season, so that much of the labour force used in the scutch mills is still employed on field work. Consequently deliveries of fibre are too small to establish price levels for the new season crop. As many processors sustained considerable financial losses last year due to the downward trend of prices it is probable that deliveries will be curtailed in an endeavour to establish a higher opening level this season. Any parcels offered currently are mostly of low grade fibre; nevertheless a good demand exists for these, prices having advanced by £5 to £10 during recent weeks.

World Using More Wool

Recovery in world wool consumption, which first showed itself in the final quarter of 1958 and again in the first quarter of this year, gained considerable further impetus during the second quarter, according to figures recently issued by the Commonwealth Economic Committee. They show that for April - June, ten countries which use about two-thirds of the world's wool, consumed a total weight representing 10% more than in the first quarter and 21% more than in the corresponding quarter of last year, which saw the lowest point of the 1957 - 58 setback. The Committee is of the opinion that the increase in daily rate of usage between the first and second quarters of this year was probably more than 10% because apart from the U.S.A.—which showed little change—the increase in daily usage by the five largest consuming countries of the free world averaged 13%.

Quickening of the rise, says the Committee, was due largely to the spread of the recovery during the second quarter to France, Italy and West Germany, where hitherto it had been delayed. The proportion of wool to total materials used in the wool textile industries of nine countries increased 60½% during the second quarter. Wool textile output in the chief manufacturing countries increased in all sections of production during April - June, but was most marked in the earlier stages of processing such as combing, and least in weaving. Thus, top production was up by 14% on the previous quarter, yarn output by 7% and cloth by 3%.

Wool consumption in the U.K. is reported to be steadying around the higher levels achieved in recent months. The Wool Industry Bureau of Statistics reports that, during July, the rate of wool consumption was slightly lower than in June, while top production was maintained at the June level. Both figures were considerably higher than a year ago.

Compared with July, 1958, the rate of wool consumption was 16% higher in both topmaking and woollen trade sections, top production 18% higher, and worsted yarn deliveries 19% higher. The wool fabric delivery rate was 3% up on the previous month and 12% more than a year earlier. Output figures for July were: wool consumption, 44·17 million lbs. (clean); top production, 30·89 million lbs.; tops drawn, 17·33 million lbs.; worsted yarns delivered, 19·09 million lbs.; woven wool fabrics delivered, 31·92 million sq. yds.; blankets delivered, 2·33 million sq. yds.

Jute Fibre, Yarn and Fabrics

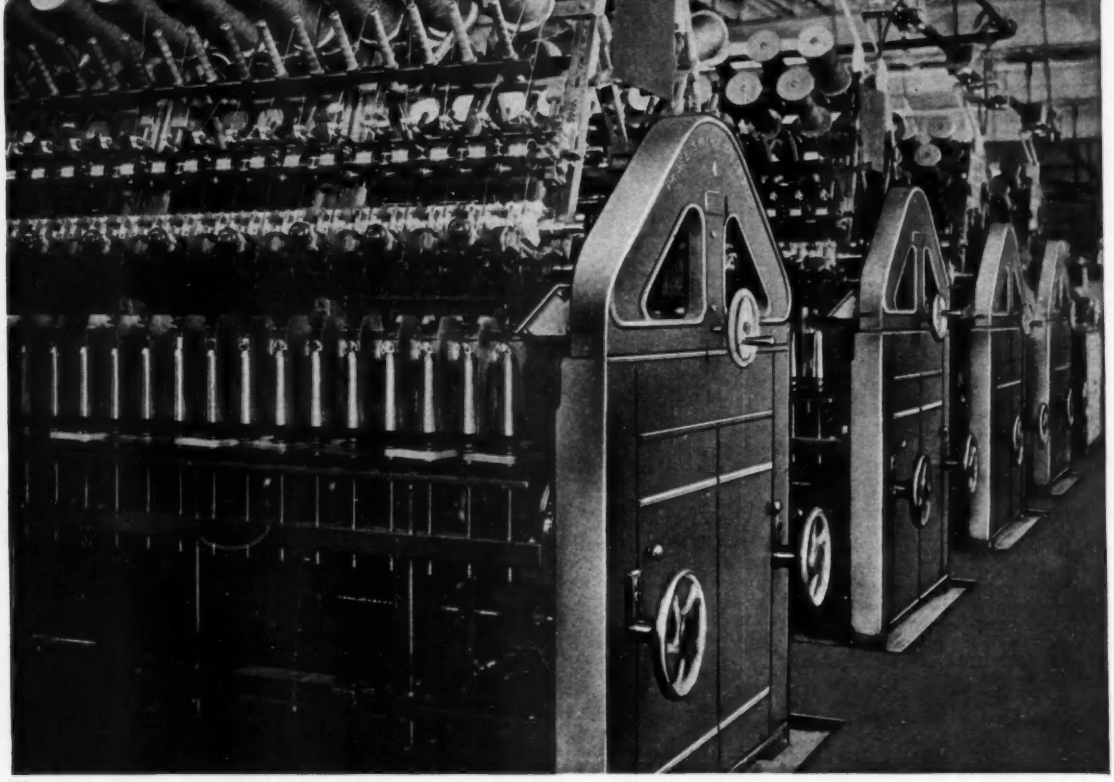
Raw jute markets in Pakistan are very quiet and the tendency is for prices to become lower. The authorities have stated that the minimum rates in force will be kept during the whole season. At present, a large weight of the crop coming on the market is reflected in lower rates. Shippers are anxious for business and a large quantity of fibre is on offer. This is normal for the time of year and there is nothing to indicate any change until after the Puja holidays.

The Enquiry Commission set up by the Pakistan Government earlier this year has issued a questionnaire covering all aspects of the industry containing 120 questions. It appears to be a genuine endeavour by Pakistan to obtain as much information as possible so that they can find the best trading methods for home trade and export. It is understood that a further questionnaire will be issued which will deal mainly with the consumers' position. Pakistan's near-world monopoly in the export of raw jute is slowly coming to an end. India has exported quantities of raw jute during the past season and there is the possibility that 500,000 bales will be available for export this season. Small quantities of Burma jute have also come on the market during the past season and it is expected that 3,000 to 5,000 tons will be available this season. The quality of Burma jute is reported upon very favourably by spinners as it is a true jute and not kenaf. These additional sources of supply are causing a certain amount of apprehension in Pakistan and the Enquiry Commission will have to take these facts into consideration. The essential requirements are that prices must be low to compete with other commodities, also values must remain as steady as possible throughout the season.

During last season Dundee spinners purchased more than 10% in excess of their consumption. This means that they are now holding fair stocks of raw material and there is no need for them to follow immediately any rise in values which should take place. On the other hand, purchases of raw jute by the U.K. during the present season will naturally be less than in season 1958 - 59. Offers of fibre are freely made with Mill Firsts at £106 10s., Mill Lightnings at £89, Mill Hearts at £79 and grade Hearts at £66, c.i.f. U.K., for Sept./Oct. shipment. Dark jute is also quiet with prices tending lower. Grade Tossa-2/3 is at £106 and grade Tossa-4 at

FINE QUALITY WORSTEDS

are produced on Cap Spinning frames with Ambler Superdraft



CAP/ASD. installations by courtesy of Messrs. W. E. YATES LTD. BRAMLEY, Nr. Leeds

The Economic Advantages of AMBLER SUPERDRAFT are :-

- Very high draft with consequent reduction in drawing machinery, labour and waste.
- Large supply packages.
- Lower end breakage rate.
- Less spinning and folding twist required, therefore 5% — 10% higher production.

OVER 100,000 ASD SPINDLES ARE IN OPERATION

PRINCE-SMITH & STELLS LTD

Incorporating TAYLOR WORDSWORTH & CO. LTD.

KEIGHLEY YORKSHIRE ENGLAND

PSS 4

£94 with Continental Tossa-2/3 at £85. Crack Tossa-2/3 is offered at £127 and crack Tossa-4 at £107. Dacca Tossa-2/3 is still scarce with the value about £143. Crack Daisee-2/3 is generally named at £93 and grade Daisee-2/3 at £85, c.i.f., U.K., for Oct./Nov. shipment. Quantities of unsold jute will very shortly be arriving at Dundee. Although there will not be any great demand for spot supplies, these parcels have been consigned when prices are at a low level which will enable holders to discount the market if there should be a rise in shipment rates during the next month or so.

The Calcutta goods market became very firm at the beginning of September and this was most noticeable in the case of heavy goods. China was then purchasing substantial quantities of "B" twills and this was followed by the incidents on the Indo-China border. However, the position eventually quietened down. Much of the rise in values was due to speculators operating as well as to actual business. Quotations are at 61s. for 10 oz. 40 ins., and at 47s. for 7¼ oz. per 100 yds. f.o.b. Calcutta for September shipment, at 61s. and 46s. 9d. October and at 61s. and 46s. November. "B" twills are at 154s. for September shipment, at 150s. October and at 148s. 3d. November.

Demand for yarns and cloth in Dundee has been fairly steady. Autumn demand started earlier and has been spread over a longer period. This gave the impression that quantities purchased were less than normal for the time of year but at present producers are well placed for delivery over the next two months and a steady business continues to take place. The heavy end of the trade in Dundee is not so well placed, and there has been a dearth of sustained demand for sackings and tarpaulins. Although this is only a small percentage of the total output of jute goods the firms concerned have come through a rather difficult period. Output of this type of cloth is below normal at present and demand is still for small quantities for early delivery.

Cotton Yarn and Cloth Markets

Business in yarn and cloth has shown a much healthier tone in recent weeks, due no doubt, to the reactions of buyers operating more quickly because of the extent of the proposed scrapping measures. Few dreamt that the total of looms, cards and spindles, to be scrapped would reach such high figures. The total, in general, must represent roughly half the productive capacity of Lancashire but it must not be forgotten that over 50% of the machinery offered to the Cotton Board for scrapping was already standing idle—most of it having been in this state for very long periods. Some in the industry are inclined to think that the Government's proposals have made the decision to scrap far too easy in that large numbers of shareholders could not ignore this opportunity to abandon the industry encouraged by such attractive terms. Although the time for some mills to shut down was long overdue, others which could have held their own in the trade are being scrapped because of their "bloated" share value for breaking-up. One cannot but admire those managements who have decided to carry on and it is to be hoped all will make full use of the help offered towards re-equipment and modernisation. A smaller but more highly efficient industry centred mainly on home requirements is far better than a sprawling, chaotic industry bogged down by surplus units producing in spasmodic fashion.

In yarn and cloth the volume and values of business have improved in no uncertain manner. Demand for yarns has covered practically all counts and qualities and the sustained enquiry has resulted in some prices stiffening rather sharply and deliveries for certain types have already lengthened. Mills still in business regard this as promising although it is still far too early to assess future prospects at this stage. Standard carded and combed weaving qualities have been in reasonably good request and counts in the medium range have sold much better. Fine combed mule doubling wefts have had a little more support but still insufficient to be regarded as good. Coarse numbers and condenser yarns are in encouraging request and the interest in blended types increases steadily. All "Terylene" and nylon staple yarns find immediate outlets, and novelty folded and fancy types are in fair demand. Total sales, in general, have shown some improvement.

The greater interest has also been reflected in manufacturing circles. Stiffening prices have resulted in more concrete enquiry embracing larger quantities spread over a wider range of goods. Dress goods in all cotton, spun rayon, nylon and other man-made fibres have been accorded greater support. Woven and printed designs in new colours and attractive combinations have created new interest, and fresh styles in shirtings have met an encouraging response. Furnishing fabrics in an ever-widening range of weave and design have benefited from the improved trading atmosphere. Jacquard and dobby woven traditional and contemporary styles have sold better and the demand has increased appreciably for roller and screen printed fabrics—particularly duplex prints in good taste and colour. In household textiles, the demand has been in similar vein. Cotton blankets, sheets, table cloths, and the usual jacquard woven cotton bedspreads have all sold better. A cheaper type of bedspread—employing certain terry principles—has sold very well but production is rather limited and unable to meet the potential demand. Terry specialities—mainly 3-pick—are in better request and hand and bath towels in attractive colour contrasts, also toning pastel shades have sold better. Bath mats are not moving very quickly, but printed designs in the piece are in good request.

Export Opportunities

Spanish Morocco:
Piece Goods

Joseph M. Hatchuel e Hijos, Calle Serrano Orive 6, Tetuan, have informed the British Consulate at Tetuan that they would like to obtain a U.K. source of supply of synthetic fibre underwear fabrics for use in the production of women's underwear. They use 30,000 metres a year. Established in Tetuan for over 70 years, they have a small factory producing women's underwear and men's shirts. Manufacturers interested should write direct with details of prices, etc., also notify the British Consulate, Boite Postale 290, Alcazar de Toledo, 4, Tetuan.

U.S.A.:
Household Textiles

Erickson Petroleum Corporation, 1422 West Lake Street, Minneapolis 8, Minnesota, U.S.A., is interested in receiving offers for import into the U.S.A. of bath towels, small scatter rugs, and bed sheets. Manufacturers interested should write direct with quotations showing both f.o.b. and c.i.f. U.S. port prices in dollars.

Transvaal:
Jute Canvas

William Jackson (Pty.) Ltd., 504 Pritchard House, Pritchard Street, Johannesburg are interested in representing a U.K. manufacturer of jute canvas in various weights and widths, proofed and unproofed. Established in 1926, they represent eight U.K. concerns for canvas and sail cloths, etc., and the territory covered is the Transvaal only. Manufacturers interested should write direct, also notify the U.K. Trade Commissioner, P.O. Box 10101, Johannesburg.

B.W. Indies
Ropes and Canvas

F. C. Almandoz and Co. Ltd., 5 Broadway, Port of Spain, Trinidad, are interested in representing U.K. manufacturers, piece goods, ropes and canvas. Manufacturers interested should write direct, also notify the U.K. Trade Commissioner, Colonial Building, 72 South Quay, P.O. Box 225, Port of Spain, Trinidad.

British Guiana:
Dress Cloths, etc.

T. Geddes Grant Ltd., P.O. Box 407, Georgetown, British Guiana, would like to represent on a commission basis U.K. manufacturers of cotton prints, dyed poplin drills, taffeta and shirtings. Manufacturers interested should write direct, also notify the U.K. Trade Commissioner, Colonial Building, 72 South Quay, P.O. Box 225, Port of Spain, Trinidad.

U.S.A.:
Twine and Rope

Blain Supply Co., Bruce, Wisconsin, are interested in importing U.K. baler and binder twine, wire rope, link and roller chain. Manufacturers interested should write direct also copy correspondence to the British Consulate, Room W 1662, First National Bank Building, St. Paul 1, Minnesota.

Yemen:
Poplin and Wool Cloth

Mohammed el Masibi would like a U.K. source of wool cloth and poplin. He is one of the leading merchants in Sana, and suppliers interested should write him, c/o British Legation, Taiz, Yemen, via Aden, giving samples and prices f.o.b. and c.i.f. Aden.

GUIDES THAT LAST A LIFETIME

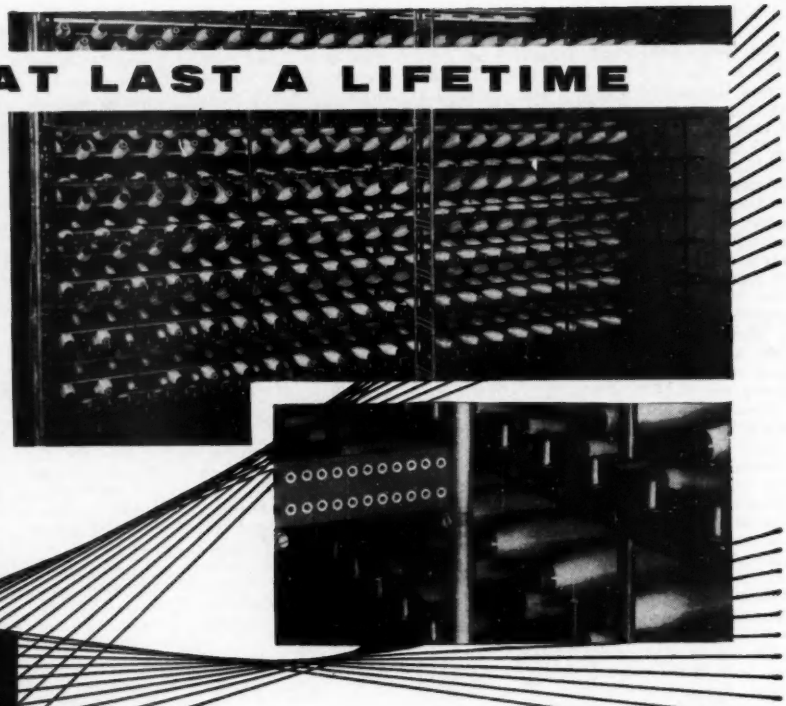
STANDARD SINTOX ceramic thread guides save expense and give indefinite life.

This is one of the Cooke Creels at the Melbourne, Derbyshire factory of Thomas Haimes and Company Limited. For the processing of nylon yarn STANDARD SINTOX thread guides have been adopted.

The Creel takes 2,368 eyelets and 672 tubes. Whereas the cost of fitting this Creel with special SINTOX guides would have been £119, the adoption of items from the SINTOX STANDARD RANGE has meant a 55% reduction in expenditure . . . and SINTOX never wears out.

Technical advice on the application of SINTOX guides will be given without obligation by the selling Agents:—

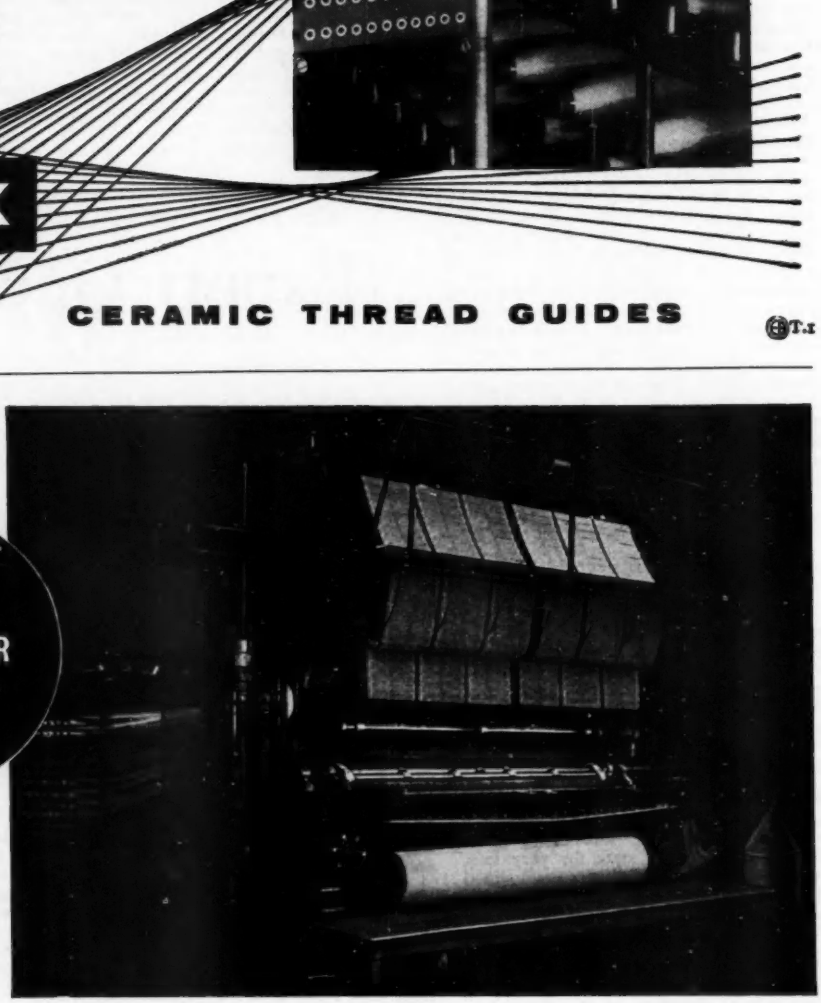
Crabtree Textile Accessories, Colne, Lancs. Telephone Colne 985 & 499
or the manufacturers:—
LODGE PLUGS LIMITED, RUGBY, SINTOX DIVISION. Tel. Rugby 2076



SINTOX

CERAMIC THREAD GUIDES T.1

GRIPPER
AXMINSTER
LOOMS



18" TO 4 YDS.
50 CM. TO 350 CM.

★ *High efficiency with proved firm gripper weave.* ✱ *Variable Quality of 4-10 rows per inch.* ✱ *Patent rotary beam for simplified warp Beam replacement.* ★ *Push button all electric control.*

Please send for full details to:
DAVID CRABTREE & SON LTD.
BRADFORD. Telephone 64252/3.
Makers of Looms for over 100 years.

CRABTREE

Notes and News

Colour for Spring and Summer 1960

The 29th set of seasonal colours issued by the British Colour Council, 13 Portman Square, London, W.1, shows that on the wool, and the silk and man-made fibres card colours shown under the caption "Cool Noon" introduce cool light colours of a somewhat different character. Typical are the tinted greys, Phantom Grey and Nimbus Grey, the blue-greys, Galway and Whispering Blue, clean greys, Caprice and Swift Grey and a neutral called Seashell with which many of the brighter colours may be worn. A run of soft smoky browns shows these are gradually returning to favour. But the delight in clean, bright colours is still evident, notably in clear bright pinks and yellows, definite blues, golden orange and flame colours, and light emerald and lime tones.

The thirty-one colours shown in the range for piece-dyed wool goods, mixture tweeds, jersey cloth and other wool fabrics, are presented in four main groups. "Spring Doubles" gives a choice of two muted blues, and two toning neutrals. "Sunny Morning" offers nine lively colours—Lime Tint, Rose Pearl, and Moonstone Grey; Young Pink, Vintage, Blazer and Breton Blue, Spring Leaf and Woodfern. "Cool Noon" illustrates a choice of colours ranging from Seashell, Roman Copper, Cedar Beige, Palmetto, Deepwater Green, Galway, Phantom, and Aspen and Tiber Green. "Grey with a Dash" shows three greys, expected to be in many Spring ranges; each is partnered by two colourful contrasts.

The range of thirty-six colours suitable for silk and man-made fibre dresses, summer suits, play-clothes and evening wear is presented in four groups. "Colours of Springtime" introduces nine clear flower-like pastels—Titian, Orchid and Marsh Rose, Butterfly, Citron, Oakleaf and Iced Lime, Crocus Tint and Calamine. In "Sunny Morning" there is a predominance of warm colours—Pacific, Golden Lily, Orange Tulip, Lobster Pink and Talisman Red. Cooler companions are Ice Blue and Caprice Grey, Panama Cream and Sugar Candy. "Cool Noon" offers nine cool elegant colours, ranging from a pale Gossamer Blue, April Sky, Blue Moon, Haiti, Carib, Oyster-Pearl, Pebble Brown, Nimbus and Whispering Blue.

The range for cotton shows twenty-two colours for plain, printed and colour woven cottons. These are Tropic Blue, Calamine Blue, Heavenly Mauve, Crocus Tint, Cyclamen, Sunkissed, Evening Primrose and Cowslip. The second page gives Hyacinth and Cornish Blue, Forget-me-Not, Indian Iris, Lupin Blue, Citron, Seafoam, Sherry Tan, Lobster Pink, Coral and Firecracker, a bright flame colour.

• • •

Widening Scope of Rubber

The annual report for 1958 of Rubber Technical Developments Ltd. states that special attention was given during the year to improving processing and manufacturing methods of certain natural rubber products.

Splitting or delamination is a characteristic of all non-woven fabrics, but one result of the year's work was to give latex bonded fabrics, developed by Rubber Technical Developments Ltd., a definite advantage in this respect. The report states "Lightweight fabrics which do not delaminate have been prepared from a great many different fibres or fibre blends, and considerable improvement have also been achieved with heavier weight fabrics using certain fibre blends." Impregnation methods have been improved and non-woven fabrics as low in weight as 1 oz./sq. yd. have been produced. Successful work has also been carried out to improve resistance to heat, dry cleaning, and detergents. The programme for the year also included a successful study of methods of reducing the processing time for rubber bonded fibres of the type used in upholstering and packaging.

Copies of the report are available from the Natural Rubber Development Board, Market Buildings, Mark Lane, London, E.C.3.

Production of Man-Made Fibres

Recovery in the man-made fibre industry continued into July when production was 38% more than in July last year, the increase being most marked in staple fibre output which was 46% more. For the first time since the setback in output some eighteen months ago, production in June and July was a little more than in the corresponding months of 1957. In the first seven months of this year there was a 14% increase in both continuous filament yarn and staple fibre compared with the same months last year.

Million lbs.	"Delivered Weight" Basis		
	C.F. Yarn (Singles)	Staple	Total
1959 May ..	18·5	20·0	38·6
July ..	19·7	25·6	45·3

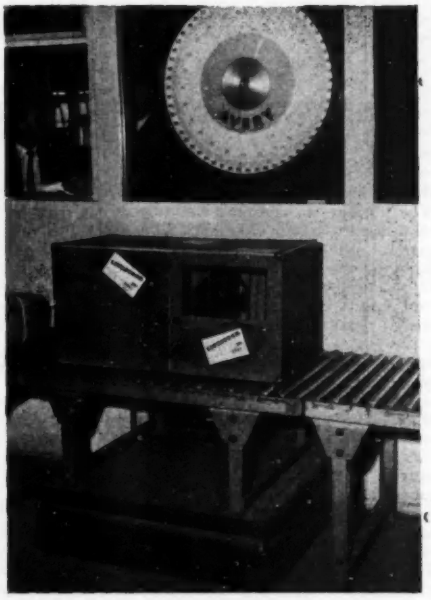
Nylon Webbing Cargo Net

A new type of cargo net made from slotted nylon webbing is now under trial. It is very light in weight and compact, and a 14 ft. square net, weighing only about 25 lbs., has made lifts of about 2 tons with ease and safety. Ease of handling is a major attraction. Besides being light the net has the advantage of increasing little in weight when wet. Furthermore, it remains flexible under all conditions. Since the webbing is flat, trucks can run over it without difficulty. Men who have used nylon nets of this type have found they reduce the labour considerably. The nylon net is extremely durable, is completely rotproof, and has outstanding resistance to abrasion.

The nylon webbing is woven with slots as an integral part and the net is made by passing the webs through each other vertically and horizontally. The slots are at frequent intervals throughout the length of the webbing so that close or open mesh can be produced as desired. Accurate weaving prevents slippage or distortion during use. The standard slotted nylon webbing, 1¼ ins. wide with slots at 1-in. intervals, has a breaking strain of 1,880 lbs.

A new type of cargo net made from slotted nylon webbing unloading flour at London Docks. The net pictured here is 14 ft. square and weighs only about 25 lbs., but has made lifts of around 2 tons

Your cargo gets JET-AGE HANDLING by BOAC



Freight travels fast *all the way*, by BOAC – on the ground as well as in the air. BOAC's new London Airport warehouse is absolutely up-to-date, with the latest mechanised handling aids to speed your goods from reception point to dispatch bay. Here are some of the ways in which BOAC's cargo system keeps pace with today's jet-swift airliners . . .

● Imports and exports are handled by entirely separate departments ● Transshipment is the responsibility of a special section – who complete the operation within an hour ● Special film section to ensure quick Customs checking and clearance ● Numerical coding of destinational airports for speed and simplicity ● On-the-spot capacity control by "Skyload" Service Unit. They answer queries and make reservations immediately, and accept urgent cargo to within 1½ hours to take-off

BOAC gives your cargo jet-age treatment all the way. And here are samples of the services which speed your goods around the world . . . .

NUMBER OF SERVICES PER WEEK	
CANADA	14
U.S.A.	45
AFRICA	27
INDIA	16
PAKISTAN ..	15
AUSTRALIA ..	11
SINGAPORE ..	13
HONG KONG ..	9
CARIBBEAN ..	5
JAPAN	4
MIDDLE EAST ..	30

All over the world

B·O·A·C

takes good care of your cargo

For full details consult your local BOAC Appointed Shipping and Forwarding Agent or ring BOAC and ask for "Skyload" Service Unit.

BRITISH OVERSEAS AIRWAYS CORPORATION

New Yarn for Knitwear

I.C.I. Ltd. has concluded an agreement with Cheslene and Crepes Ltd., Macclesfield, to purchase the British patent rights relating to a process for the manufacture of a new bulked filament yarn. A number of British processors are being licensed by I.C.I. to produce the new yarn, and the original agreement with Cheslene and Crpes Ltd. includes the right to license the sale throughout the world of yarns made by the British licensees. The process is particularly suited to the manufacture of bulked yarn from "Terylene." "Crimplene" combines a high degree of bulk with a low degree of stretch. It is also dimensionally stable, which makes it suitable for the production of hand knitting yarns and for use by those sections of the high-class fashion knitwear trade that do not make use of stabilising after-treatments. "Crimplene" has the advantage too, that it can be used directly as a singles yarn for circular knitting and warp knitting, and it will make possible the production of new types of woven fabrics.

* * *

Wool Research

Organised by the Textile Institute, the second quinquennial Wool Research Conference to be held at Harrogate, May 18 - 25, 1960, is expected to provide a platform for about 70 papers by world experts. The first conference of this nature was organised in Australia in 1955 by the C.S.I.R.O.

* * *

T.I. Jubilee Year

Leicester is the venue for the Textile Institute's annual general meeting in Jubilee Year, 1960. The date—April 22—is the exact date when the Institute's inaugural meeting was held in the Midland Hotel, Manchester, in 1910.

* * *

New Dexion Accessories

Two new accessories for use with slotted angle have been added to the range of products made by Dexion Ltd., Maygrove Road, London, N.W.6. They are the T-section plastic foot and the 4-in. rubber castor. The foot is designed for use with "140" ($1\frac{1}{2} \times 1\frac{1}{2}$ ins.) angle. Made of tough grey plastic, it provides non-slip contact and can easily be screwed to the floor for added rigidity. The 4-in. rubber castor is for heavy loads and uneven surfaces. Each heavy-duty castor can take a load of up to 200 lbs.

* * *

Coating Compounds

Three styrene/butadiene copolymer latices are now being manufactured at the Newport, Mon., factory of Monsanto Chemicals Ltd. These are suitable for use in coatings and for non-iron fabrics, also for the backings of tufted carpets and rugs. Latex SB1 contains approximately 60% styrene. Latex SB2 is similar but contains a stabiliser which improves resistance to breakdown when subjected to strong shearing forces. Enquiries should be made to Monsanto Chemicals Ltd., Monsanto House, 10 - 18 Victoria Street, London, S.W.1.

* * *

Filtering Cement Slurry

A process for employing filtration to remove a substantial proportion of the water content from cement slurry before it is dried in the kilns has been developed by British Portland Cement Manufacturers Ltd. The filter cloths are nylon. After experiments it was found that the most satisfactory results were achieved with a 12½-oz./sq. yd. continuous filament plain weave fabric. Although the initial cost is high, this has a very long life as a result of nylon's great tensile strength. The cloths are hosed down in the press room about once a fortnight and there has been no trouble from blinding. Records kept during a period of 12 months showed that the average initial life of a nylon cloth was 2,000 pressings and that its total life after repairs was 3,000 pressings during which time it handled about 375 tons.

* * *

New Course on Man-Made Fibres

To review some of the more important new processes for the manufacture of yarns a post-advanced course of ten lectures on the subject "New Techniques in Yarn Manufacture from Man-Made Fibres" is to be held at Manchester College of Science and Technology on consecutive Monday evenings from October 12 to December 14. The organising lecturer is Mr. G. R. Wray, M.Sc.Tech., A.T.I., G.I.Mech.E., and specialists will lecture on the following topics: tow-to-sliver conversion systems, and the spinning of such uncarded and uncombed slivers into yarns; the production of high-bulk acrylic yarns from stretch-broken and cut filament tow; the direct spinning of yarns from filament tows; bulked yarns produced by false-twisting, edge-crimping, and air-texturing processes; the weaving and knitting behaviour of the new yarns. Full particulars can be obtained from the registrar of the college.

* * *

Boilerhouse Equipment

The Hodgkinson Group of Companies announce that Bennis Combustion Ltd. are now manufacturing the new 8 ins. universal elevator for boilerhouse applications. It is the familiar chain and bucket type, designed to handle the usual boilerhouse fuels at rates up to 1½ tons per hour. Standardisation is the keyword and this has resulted in many advantages. Any length of elevator, for any inclination of between 60° and vertical, can be built up from a series of standard components and the design is so simple that an elevator can be bolted together and lifted into position in a matter of hours. There are five basic units—the feeding mechanism, the boot, lower section, mid-section and the head which incorporates the drive. The standard mid-sections are approximately 8 ft. in length but smaller sizes are available so that any particular length of elevator can be built up. Also a special curved mid-section can be supplied where site conditions make a vertical elevator necessary.

New Companies

Oxted Linen Co. Ltd. Private. Reg. June 18. Capital £600 in £1 shares. Spinners, winders, and doublers. Registered office: 2 Plaza Chambers, Station Road West, Oxted.

Tuftcraft Ltd. Private. Reg. June 18. Capital £5,000 in £1 shares. Manufacturers, importers, exporters, and dealers in candlewick bedspreads and quilts, etc. Registered office: Springwell Mills, Henry Street, Batley Carr, Batley, Yorks.

E. Klein Ltd. Private. Reg. June 19. Capital £1,000 in £1 shares. Importers, exporters, merchants and dealers in waste wool, cotton, linen, rags, etc. Registered office: 10 Coleman Street, E.C.2.

John Foster and Son (Manufacturing) Ltd. Private. Reg. June 23. Capital: £100,000 in £1 shares. Cloth manufacturers, etc. Solicitors: Slaughter and May, 18 Austin Friars, E.C.2.

John Foster and Son (Pile Fabrics) Ltd. Private. Reg. June 23. Capital: £50,000 in £1 shares. Manufacturers and dealers in pile and furnishing fabrics, etc. Particulars similar to John Foster and Son (Manufacturing) Ltd.

John Foster and Son (Yarns) Ltd. Private. Reg. June 23. Capital: £100,000 in £1 shares. Combers, topmakers, spinners, etc. Particulars similar to John Foster and Son (Manufacturing) Ltd.

B. and R. Bridge Ltd. Private. Reg. June 25. Capital £1,000 in £1 shares. Wholesalers, retailers, importers and exporters of woollen and cotton goods, wearing apparel, etc. Registered office: 34 South Molton Street, W.1.

Ashfield Textiles Ltd. Private. Reg. June 24. Capital £1,000 in £1 shares. Commission weavers, etc. Solicitors: Simpson Curtis and Co., Leeds 1.

A. H. Vane and Co. Ltd. Private. Reg. June 26. Capital £20,000 in £1 shares. Manufacturers, converters, agents, merchants, textile piece goods' tapes, webbings, etc. Registered office: Iando House, 43 Bartholomew Close, E.C.1.

G. S. Allan and Co. Ltd. Private. Reg. June 26. Capital: £1,000 in £1 shares. Importers, exporters, manufacturers and dealers in textiles, plant, machinery, etc. Registered office: 66 Tyrwhitt Road, S.E.4.

Solent Carpet Co. Ltd. Private. Reg. July 1. Capital £255,000 in £1 shares. Manufacturers and dealers in carpets, rugs, mats and all kinds of floor coverings, etc. Solicitors: Ashurst Morris Crisp and Co., 17 Throgmorton Avenue, E.C.2.

James L. Kelly Ltd. Private. Reg. July 1. Capital £500 in £1 shares. Manufacturers, suppliers, wholesalers, and retailers of fabrics, etc. Registered office: District Bank Chambers, Fleece Street, Rochdale.

Pennine Textiles Ltd. Private. Reg. July 1 Capital £1,000 in £1 shares. Manufacturers of rugs and carpets, etc. Registered office: Pennine Mills, Fenton Street, Barnsley.

Manchester Grey Cloths Ltd. Private. Reg. July 3. Capital £5,000 in £1 shares. Manufacturers, importers and dealers in cloth, etc. Solicitors: Whittingham, Glass and Morrison, Manchester 2.

Premier Quilting Co. Ltd. Private. Reg. July 6. Capital £1,000 in £1 shares. Manufacturers, importers, exporters, wholesale and retail dealers in quilts and quilting, etc. Registered office: 102 Bishopsgate, E.C.2.

Reymond Knitwear Ltd. Private. Reg. July 6. Capital £5,000 in £1 shares. Knitwear manufacturers and merchants, etc. Registered office: Northbrook Works, Southdownview Road, Worthing.

Charles Bickmore Ltd. Private. Reg. Aug. 13. Capital £2,000 in £1 shares (1,000 "A" and 1,000 "B"). Dealers and manufacturers of cotton, woollen, calico, damask, silk, rayon, etc. Registered office: 90 Deansgate, Manchester 3.

Nichols and Hill Ltd. Private. Reg. Aug. 14. Capital £1,000 in £1 shares. Merchants, dealers, importers and exporters of all kinds of textile goods, etc. Registered office: Walmar House, 288 Regent Street, W.1.

Viciane Wools (Bradford) Ltd. Private. Reg. Aug. 18. Capital £30,000 in £1 shares. Importers, exporters, and dealers in wool, hair, cotton, silk and Aug. 18. Capital £30,000 in £1 shares. Importers, other fibrous substances, etc. Registered office: Bridge House, 24 Sunbridge Road, Bradford 1.

Hanson and Clugston Ltd. Private. Reg. Aug. 24. Capital £2,000 in £1 shares. Textile merchants, manufacturers, converters, exporters and importers. Registered office: 4a Roby Street, Manchester 1.

Carrington and Lewis Ltd. Private. Reg. Sept. 2. Capital £1,000 in £1 shares. Manufacturers and dealers in woollen goods, soft furnishings, etc. Secretary: D. T. Rodgers, 83 Ebury Street, S.W.1.

A. Stafley (Textiles) Ltd. Private. Reg. Sept. 3. Capital £1,000 in £1 shares. Manufacturers and dealers in textiles, etc. Registered office: 120 Baker Street, W.1.

J. C. (Bradford) Ltd. Private. Reg. Sept. 4. Capital £1,000 in £1 shares. Merchants, agents, brokers, dealers in yarn, wool, etc. Solicitors: Sugden and Johnson, Bradford 1. Registered office: Globus Buildings, Smith Street, Bradford 7.

Price and Buckland Ltd. Private. Reg. Sept. 8. Capital £25,000 in £1 shares. Manufacturers and dealers in cloth, wool, etc. Registered office: 2a Cross Street, Arnold, Notts.

SHRINK RESIST

Dylan REGD

SOFT HANDLE

in action

Leading British commission dyers now using the Stevenson shrink-resist processes under the DYLAN trade mark.

Goods handled by these companies can share in the extensive publicity for DYLAN.

Ashfield Dyeing & Finishing Co. Ltd., Sutton-in-Ashfield, Nottingham.

Henry Ashwell & Co. Ltd., Radford Road, New Basford, Nottingham.

Bowmars Ltd., Leicester.

Bulwell Finishing Co. Ltd., Bulwell, Nottingham.

Fosse Dyeworks Ltd., Syston, Leicester.

H. Harrison & Co. (Finishers) Ltd., Leicester.

Hicking Pentecost & Co. (N.I.) Ltd., Ballymena, Co. Antrim.

Lindley & Lindley, Nottingham.

Loughborough Dyeworks Ltd., Loughborough, Leicester.

James McHaffie & Son Ltd., Neilston, nr. Glasgow.

Martins (Leicester) Ltd., Leicester.

Murray Bros. & Co. Ltd., (branch of Spray & Burgass Ltd.), Bagnall Dye Works, Bulwell, Nottingham.

Robinson Bros. (Greenfield) Ltd., Greenfield, Yorkshire.

W. E. Saxby (Leicester) Ltd., Leicester.

W. E. Saxby (Nottingham) Ltd., Nottingham.

Scottish Wool Bleachers & Dyers Ltd., Barrhead, nr. Glasgow.

South Knighton Dye Works Ltd., Leicester.

The Springfield Hosiery Finishing Co. Ltd., Hucknall Lane, Bulwell, Nottingham.

Weldon & Wilkinson Ltd., New Basford, Nottingham.

Norman Wood & Son Ltd., Birkshall Lane, Bradford.

If you would like to know more about what DYLAN can mean to *your* brands, write to the DYLAN PROMOTION and TECHNICAL SERVICE, AMBERGATE, DERBY.

SPRINGS, PRESSINGS, WIREWORK AND SPRING WASHERS

ALL TYPES OF SPRINGS FOR ELECTRICAL AND MECHANICAL NEEDS

CHURCHFIELDS SPRING CO·LTD

BANK STREET, HALL END, WEST BROMWICH
TEL: STOneycross 2605/8 pBX

North of England Representative
MR. V. W. SMIRLES, 14 KING'S ROAD, CHEADLE HULME, CHESHIRE
Telephone: Hulme Hall 2097

Practical Textbooks For The Textile Industry

	Net Price	*By Post*
MACHINERY, MANAGEMENT AND CONTROL IN A WOOL TEXTILE FACTORY By D. R. H. WILLIAMS	35s. 0d.	35s. 8d.
WOOLLEN AND WORSTED YARN MANUFACTURE By J. W. RADCLIFFE	21s. 0d.	21s. 6d.
RAYON STAPLE FIBRE SPINNING By S. A. G. CALDWELL	21s. 0d.	21s. 6d.
WINDING, WARPING AND WEAVING By W. BARKER	2s. 0d.	2s. 1d.
TESTING OF YARNS AND FABRICS By N. EYRE, A.T.I.	3s. 6d.	3s. 8d.
LOOM TUNING By W. MIDDLEBROOK	2s. 6d.	2s. 9d.
HEALDS FOR WEAVING By I. LAIRD	4s. 6d.	4s. 8d.
SECONDARY ASPECTS OF THE POWER LOOM By W. MIDDLEBROOK	5s. 0d.	5s. 2d.

EMMOTT & CO. LTD.
31 KING STREET WEST, MANCHESTER 3
and
158 TEMPLE CHAMBERS, TEMPLE AVE., LONDON, E.C.4.

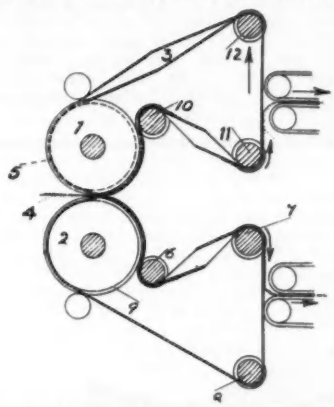
RECENT TEXTILE PATENTS

These abridgements are republished from specifications by permission of the Controller of H.M. Stationery Office. The full specifications can be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2. Price 3s. each.

789,897 Tape Web Dividers for Carding Engines

K. JAKUBECKI, *Saar Platz 3, Vienna XIX, Austria.*

Improved tape web divider for cards by which the quality of the yarn and the output of the set of cards are controlled. The web divider consists of two grooved rollers 1 and 2, running in opposite directions, and guide rollers, and the two main rollers are provided with peripheral grooves. Each divider tape 3, the width of which corresponds to the width of the grooves, is so guided that on the inlet side of the web 4, it engages in a groove 5 in roller, and slightly behind the roller apices runs on to an ungrooved rear part, situated between two grooves, of the periphery of the roller 2. The tape then runs around a



guide roller 6, whereupon, turned by 180°, it is supplied to another roller 7 in such manner that it is there offset by one groove width so that the tape, after running over roller 8, can travel around the front part of the roller 2 in a groove 9. Slightly behind the apices of the rollers 1 and 2, the tape runs around on a rear, ungrooved part of roller 1 lying opposite the groove 9 in roller 2, is guided round by roller 10 and, turned by 180°, is passed on to guide roller 11. The tape is then guided around roller 12 and again turned 180°, while at the same time the tape is displaced one groove width, so that it thereupon again runs into groove 5 on the front part of roller 1.

789,972 Improved Hand-Threaded Shuttle

A. BENNETT AND SONS (TEXTILES) LTD., *Jubilee Mill, Holly Street, Blackburn,* and PILTEX LTD., *Roach Works, Crawford Street, Rochdale.*

Loom shuttles of the hand threading kind which are of comparatively simple construction and which cannot readily become unthreaded during weaving. The shuttle is provided with an inclined slot which at one end leads from the weft hole to the upper surface of the shuttle and at the other end extends to the side of the shuttle, terminating in a hole which leads from the weft hole to the side of the shuttle. A tongue-like member extends along the shuttle and above the weft hole and arranged so that the weft may be led from the yarn package to one side of this member and passed through the slot around the member until it is in a position from which it can be taken hold of by the operator and pulled to complete the threading of the shuttle.

794,223 Hydraulic Damper in Warp Let-Off

ADOLPH SAURER LTD., *Arbon, Switzerland.*

A warp let-off motion for looms, in which for the purpose of producing the tension of the threads, a force corresponding to the desired tension applies a turning moment to the beam. A single-acting hydraulic damper acts, through a lever arm, on the beam so that it greatly resists the twisting of the beam in the direction of the turning moment produced by the force, whereas it is practically without effect in respect of twisting against the force. The point of action of the damper is arranged to be slidable along the lever arm.

795,115 Automatic Doffing on Pirn Winder

OFFICINA MECCANICA BRUEGGER, S.P.A., 27 *Via Borsieri, Como, Italy.*

A device for removing a pirn from a winding machine spindle, comprises a lead screw-and-nut mechanism adapted to be actuated, upon completion of the package, to displace the spindle and remove it from the package. The pirn is restrained against movement by reaction of its conical portion against an associated roller

797,700 Uniform Warp Beaming

ALGEMENE KUNSTZIJDE UNIE N.V., 76 *Velperweg, Arnhem, Holland.*

Method of warping on beams comprises dividing each of the threads from primary thread packages into lengths equal to the length of the beam required, and thread bands are formed from the lengths of thread in such manner that each band comprises one thread from each package and all the threads in it come from a corresponding part of the packages. The thread bands so formed are wound consecutively on to a warp beam in the same sequence as the threads in them had in the packages. The fabrics manufactured with these warp beams make a very uniform impression, both as regards the lustre and colour.

799,718 Curled Threads, Fibres and like Products

N. V. ONDERZOEKINGSINSTITUUT RESEARCH, 76 *Velperweg, Arnhem, Holland*

Process for the manufacture of crimped threads and fibres, whereby a viscose with a cellulose-alkali ratio of at least 10 : 6 is spun. An acid bath contains sodium sulphate, zinc sulphate and sulphuric acid in a proportion which is less than 1·4 times the alkali content of the viscose. The formed threads are stretched and finally the tension is released in a swelling agent. The threads are spun, in the presence of a surface-active substance, in a bath containing in addition from 0·5 to 5% by weight of ammonium sulphate. In one example to a viscose with a cellulose content of 8·6% and an alkali content of 4·8%, 0·3%, calculated on the cellulose of the ethylene oxide derivative Hüls V 1011 T., was added. The viscose was spun at a ripeness of 6·5° Hottenroth in a bath containing 4·5% of sulphuric acid, 20% of sodium sulphate, 1·5% of ammonium sulphate and 1% of zinc sulphate. The temperature of the bath mounted to 50°C. After leaving the bath the thread was stretched 50% in water at 90°C. Next the threads were cut to fibres and the fibres were brought into water at 90°C. In the hot water the filaments crimped spontaneously.

797,958 Bleaching Acrylonitrile Fibres

CHEMSTRAND CORPORATION, *Decatur, Alabama, U.S.A.*

A method of bleaching acrylic fibres containing at least 80% by weight of acrylonitrile and 2% - 10% of N-heterocyclic monomer in polymeric form which results in whiter fibres and which improves the light sensitivity characteristics of the fibres. The fibres are treated with a 0·05% to 0·5% by weight solution of a strong mineral acid and then treated with a solution of sodium chlorite amounting to from 2·5% to 6·0% sodium chlorite based on the weight of fibres treated, at a temperature of from about 140° to 180°F. until no further bleaching occurs.

798,799 Continuous Bleaching of Cotton Fabrics

FOOD MACHINERY AND CHEMICAL CORPORATION, 1105 *Coleman Street, San Jose, California, U.S.A.*

A method of bleaching cotton fabric in which the fabric is impregnated with about its own weight of an alkaline solution of a peroxygen compound and heated with steam. The solution is free from added silicate and contains at least 0·3% based on the weight of the goods, of an alkali metal compound yielding orthophosphate ions, and a total in the system of 0·02% of a compound yielding alkaline earth metal ions, and an agent for buffering the solution within the range of ph 9 to ph 11. Where the cotton has been previously kier boiled, to maintain the best bleaching conditions it is necessary to add a small amount of a salt of an alkali earth metal, preferably a calcium salt. In one example, a bleaching solution was prepared containing ·5% hydrogen peroxide, 200 parts per million calcium chloride, and 2·0% disodium phosphate duohydrate. The ph was adjusted to 10·7 with sodium hydroxide and the mixture was agitated to keep the precipitated calcium phosphate suspended. This solution was fed to a bleaching pad box where the normal solution take up was

100% on the goods by weight, and desized cotton fabrics were bleached continuously on a conventional open width bleaching range for 3 shifts without stopping. At the end of the run, the storage J box was inspected and instead of the usual deposit, the walls of the J box appeared to have been polished even more highly by the passage of the fabric.

799,606 Fire-Resistant Textile Materials

BLEACHERS' ASSOCIATION LTD., *Blackfriars House, Manchester*, A. E. STUBBS, *and* L. T. WHITTAKER.

Treatment of fabrics to impart fire- and glow-resistant properties to such materials, preferably combined with crease-resistance, stability or other desirable properties, and it is desirable that such properties should be unaffected by laundering. The material is impregnated with a solution containing an intermediate condensation product of formaldehyde and an ester of phosphorodiamidic acid, together with an acidic, or acid-yielding, catalyst for the condensation. The material is then dried and heated to complete the condensation and form the insoluble resin. In one example, a mixture of 10 g. of ethyl phosphorodiamidate and 10 g. of urea was dissolved in a mixture of 30 ml. of neutral 38% formaldehyde solution and 2 ml. of concentrated ammonia (sp.gr. 0·88). The resulting solution was allowed to stand for 4 hours, no heat being applied. A solution of 2 g. of citric acid was added to the mixture, which was made up with water to 100 ml. and applied by padding to a cotton drill, the pick-up being 100%. The fabric was dried with warm air, heated for 8 mins. at 140°C., soaped, rinsed, and dried. The fabric, which was of good handle, did not readily ignite when applied to a naked flame. Flame was not readily propagated in the fabric, and there was no afterglow. The fire-retardant properties were not greatly impaired by a laundering treatment.

800,074 Improved Rectilinear Combs

WOOLCOMBERS LTD., *Daisy Bank, Duckworth Lane, Bradford.*

Wool combing machines of the Rectilinear or French type with a construction of top grid in which the bars are detachable from the grid assembly so that any bar can be detached readily and replaced. The top grid comprises two end members B each provided with a series of recesses *b* to receive the ends of a corresponding number of bars C. The bars are a push in fit in the recesses so that they can be manually engaged and disengaged. The recesses and the bars are circular and the bars are preferably of mild steel so as to be free to give a little under pressure. The bars are arranged so that the top surfaces of the end members B are above the top of the bars so that the impact of the descending gill plate is taken by the end members and not by the bars. The end members are provided with holes b^1 to receive the bolts by means of which the grid is secured to the lower grid. An independent lead-in plate A is arranged in front of the top grid and the bottom grid of the comb to guide the wool between them.

800,091 Fluid Bed Treatment of Filaments, Materials, etc.

BRITISH RAYON RESEARCH ASSOCIATION, *Bridgewater House, Whitworth Street, Manchester.*

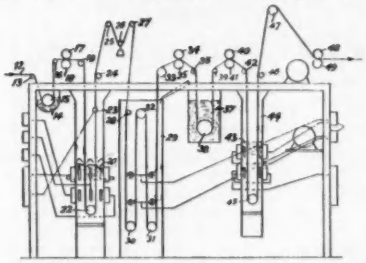
A method of heat treatment in which a filament, fibre, thread, film or sheet, or a material formed therefrom, while in the dry state, is located in a bed of hot solid concrete particles, while the bed is subjected to an upward gaseous current, the size and weight of the particles, the velocity and nature of the current and the disposition of the filament, fibre, thread, film, sheet, or of the material formed therefrom being so chosen that the forces exerted by the current on the particles are sufficient to counter-balance the gravitational force on free particles and to expand the bed, thus allowing movement of the particles, but is insufficient to convert the whole bed into a uni-directional stream of moving particles. The fabric 12 passes first over a stainless steel guide roller 13 to a dye-bath 14 and under roller 15. It next passes over a guide roller 16, between mangling rollers 17, 18 the upper one rubber-surfaced and the lower one stainless steel, and over a rubber guide roller 19, before going down into a fluidised bed 20. After passing beneath a ceramic roller 22 the fabric passes up over an agitating rod 24. The fabric passes over

THE
36/AZ
RAISING
MACHINE

INCLUDES MANY NOVEL FEATURES IN DESIGN AND CONSTRUCTION AND REPRESENTS THE LATEST DEVELOPMENT IN THE NOW WORLD-FAMOUS-AUTO-ZERO CONTROL SYSTEM.

TOMLINSONS (ROCHDALE) LTD., OLDHAM ROAD, ROCHDALE

glass roller 25, down beneath a weighted stainless steel roller 26, and upward over glass roller 27, before moving again downward behind a stainless steel guide roller 28 near the top of a soaping bath 29. In this bath the fabric performs a double run round rollers 30, 31 and an upper stainless steel roller 32. The fabric finally passes upwardly out of bath 29 over a barrel-shaped stainless steel roller 33, between a second pair of mangling rollers 34, 35, over a glass guide roller 36 and then down into rinsing bath 37. At the bottom of the rinsing bath 37 the fabric moves around a large stainless steel roller 38 before moving to pass between a third pair of mangling rollers



40, 41, before moving over a glass guide roller 42, and then, in downward direction into a second fluidised bed 43 in a container 44. After passing beneath a ceramic roller 45 similar to roller 22 the fabric moves in an upward direction over a square-sectioned agitating rod 46 a final guide roller 47 and out of the machine through a fourth pair of mangling rollers 48, 49. In one example, "Terylene" spun fabric was dyed in a silica sand fluidised bed at 190°C. for 11 secs. after padding with a liquor containing 5% by weight Duranol Blue G 300, 5% by volume of triethanolamine, the remainder being water containing 2 parts per 1,000 of the wetting agent Perminal PP and the sample was satisfactorily dyed to a deep shade. When dyeing nylon it appears to be easier to find conditions to give level dyeing when the fabric is made to enter the heated fluidised bed directly from the mangles and while still wet (i.e. the bed is effective firstly to dry the fabric before being effective, secondly to fix the dye on the dry fabric), but for "Terylene" and cellulose triacetate a preliminary drying stage at moderate temperatures before final fixation in the high temperature fluidised bed, makes little difference to the final result. Other dyes which have been successfully applied include certain vat dyes.

800,157 Flame-proof Finish to Textile Materials

COURTAULDS LTD., 16 *St. Martin's-le-Grand, London.*

A process for imparting a flame-proof, weather-resistant finish to cellulosic textile materials comprises treating the material with (*a*) antimony trioxide or a mixture of antimony trioxide and another metallic oxide, (*b*) a chlorine-containing synthetic resin and (*c*) an aminoplast, drying and baking the treated material. The treatment is preferably effected in a single bath but if desired the materials may first be treated with the aminoplast, dried and baked and then treated with the antimony trioxide and chlorine-containing synthetic resin. In one example, 1,000 grams of antimony trioxide were made into a paste which was diluted with water to give a fine dispersion of antimony trioxide in 2,000 ccs. of water. 8,750 ccs. of a polyvinyl chloride emulsion containing about 50% of solids was added to the antimony trioxide dispersion and after the desired degree of dispersion had been achieved, the mixture was emptied into another vessel and a solution containing 8,750 ccs. of a urea-formaldehyde precondensate having about 40% of solids, 175 ccs. of a 20% ammonium thiocyanate solution and 1,400 ccs. of water was added with stirring. This mixture was stable for long periods. A fabric made from 100% viscose rayon staple was impregnated with this emulsion on a pad mangle. The impregnated fabric was dried below 100°C. and baked at 150°C. for 2 mins. The fabric was flame-proof, weather-resistant and had a rigid finish and a water-imbibition of 31%.

800,271 Mechanical Doffing Apparatus for Spinning Frames

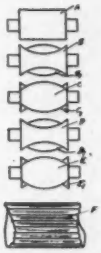
W. HATCH, 54 *Higginshaw Road, Oldham.*

Mechanical doffing apparatus for a spinning frame comprises a lifting rack mounted on a carrier structure which can be swung into and out of an operative position in which the rack is engaged with the lower ends of full packages. The rack is then slidable upward on its carrier for the purpose of lifting the packages clear of the spindles. Means are associated with the carrier whereby when the packages are fully lifted, the yarns are simultaneously severed. Means are carried by the rack for receiving the packages and conveying them successively to a collecting point. A horizontal rail with holders for empty tubes is normally aligned above the spindles, and a perforated slide in the rail normally supports the tubes in their holders but is movable to allow them to drop through on to the spindles after doffing of the packages and movement of the rack carrier to an out-of-use position. The rail is then lowerable so that the associated slide, when in its normal position, can press the released tubes home upon their spindles.

800,432 Drafting Nylon Staple

BRITISH NYLON SPINNERS LTD., *Pontypool, Monmouthshire.*

Means for randomizing staple fibres in a sliver, and to eradicate the presence of co-terminous tufts in the sliver. A drafting sequence of rollers for use on the worsted system comprises feed rollers A of 2-in. diameter and four pairs BB_1, CC_1, DD_1 and EE_1 of convex/concave rollers, whose minimum diameter is 1 in., maximum diameter 2 ins. and width 3 ins., the bottom rollers B_1, C_1, D_1 and E_1 being of metal and being alternately convex and concave, and the top rollers B, C, D and E being covered and being alternately concave and convex. The back feed rollers F of a gill box are positioned ahead of the last pair of convex/concave rollers which may be fluted. A combed sliver composed of, say, staple fibres of nylon of 4-in. average length, is



fed through the feed rollers A which may rotate at 8·6 r.p.m., to the rollers BB_1 rotating at 19 r.p.m. where a differential draft is applied to the material across the width owing to the surface speed of points on the periphery of the rollers varying between 5 and 10 ft./min. A differential draft of opposite sense is applied to the material by the next pair CC_1, rotating at 42 r.p.m., and then in reverse sense by the next pair DD_1 rotating at 91 r.p.m., and finally by the last pair EE_1 rotating at 195 r.p.m. where the surface speeds vary between 50 and 100 ft./min. In this manner, the material is levelled to a degree quite impossible when using conventional worsted drafting apparatus.

MANCHESTER METAL WORKS LTD.

368-376 Bury New Road,

Phone: BROUGHTON 1953-4 **SALFORD 7, ENGLAND**

BETTER REGULATION AND SLUB CLEARING

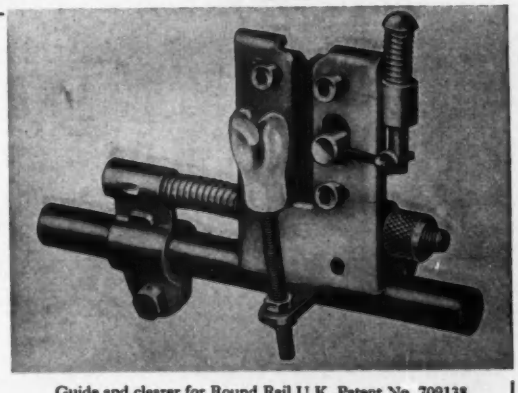
WITH THE

"MANCHESTER" COMBINED GUIDE AND CLEARER

- FOR WOOD OR METAL RAILS
- BLADES ADJUSTABLE AND REVERSIBLE
- YARN GUIDE PROVIDED
- ALL STEEL: RUSTPROOF FINISH
- GAP CAN BE SET ACCURATELY IN 8 TO 10 SECONDS WITHOUT REMOVING CLEARER

A PERFECT COMBINATION WITH "MANCHESTER" EXPANDING SWIFTS AND TENSION UNITS

Sole British Agents for the Superfine Texlan Dropper Wires.



Guide and clearer for Round Rail U.K. Patent No. 709138

CLASSIFIED ADVERTISEMENTS

Classified advertisements are inserted at the rate of 3/- per line.

Machinery Plant and Accessories Wanted

SECOND-HAND Button Breaking Machine Wanted. Please send full particulars. Write 0191 Wm. Porteous & Co., Glasgow.

WANTED—Hank to Bottle winder, preferably Stubbs Rabbeth type. Full particulars to John C. Small & Tidmas Ltd., Peace Mills, Perry Road, Sherwood, Nottingham.

SECOND-HAND Raising Machines Wanted. State Age, type, maker, etc. Write 1892 Wm. Porteous and Co., Glasgow.

COTTON Spinner and Manufacturer staying on in the trade, interested in finding the following pieces of equipment from mills leaving trade:

(a) "W.I.R.A." Fineness Meter (Cotton Model) for Micronaire reading.
(b) Single Thread Tester (preferably motor driven),
(c) Yarn Regularity Tester (Fielden-Walker, or Uster).
(d) Microscope with movable stage, three objective lenses.
(e) Humidifier units (Textile Air System), Motor to be suitable for 230 volts supply condenser start and run.
(f) Skips or bobbin trolleys.

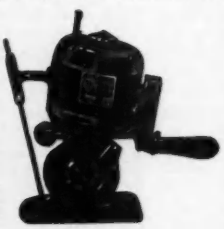
Replies to Box No. T.M.30, "Textile Manufacturer," 31 King Street West, Manchester 3.

NEW HIGH-SPEED PORTABLE

ELECTRIC

CLOTH CUTTERS

For Bulk Cutting of all Textiles: Cloth, Fabric Duck, Felt, Canvas, Wool, Wadding Waste, and general making-up trades, etc. Will do the work of six hand cutters.



Straight and Round Knives.

Built here in original famous "UNITY" Registered models.

L. LINZ & SONS LTD.

PARK STREET, Manchester 3

Blackfriars 5131/2 Estd. over Half-a-Century

WANTED: Old Loom Spindles, 24-inch. State Quantity, Price and Condition. Offers to Box No. T.M.29, "Textile Manufacturer," 31 King Street West, Manchester 3.

ADVERTISER wishes to purchase four Hattersley Narrow Fast Looms for pattern weaving. Must be in good condition. Offer to Box No. T.M. 28, "Textile Manufacturer," 31 King Street West, Manchester 3.

WANTED: Dry Ring Doublers preferably Tweedales and Smalley, 2½" Ring, 8" lift in good condition; state year of manufacture. Box No. T.M.31, "Textile Manufacturer," 31 King Street West, Manchester 3.

Machinery, Plant and Accessories for Sale

SIX Automatic Single Shuttle Changing Benninger Looms with Staubli treadle motions. Five at 155 cms. reed space and one at 135 cms.
Five Hodge 12-Carrier High Speed Braiders. Carriers 100 r.p.m. Purchased 1955 but run less than six months.
One Carter 8-Carrier 'E' type Braider for Sashcords ⅜" to ¾" dia.
Fraser double crank, 12 pair Circular Hemp Softener.
Mackie Roving Frame used for processing staple nylon. Purchased 1951, little used.
Forty-Spindle Universal style 44 'Roto Coner' used for staple nylon. Purchased 1952, but little used.
All above complete with motors, drives and switchgear suitable for 440/3/50.
Enquiries to Box No. T.M.32, "Textile Manufacturer," 31 King Street West, Manchester 3.

FULL Steam in five minutes with B. and A. Electrode Boilers, used by British industries for over 25 years. No boilerhouse, no flue, no attendant needed. The most compact and convenient steam raisers available, can go beside machines using the steam. Write for leaflet 220. Bastian and Allen Ltd., Ferndale Terrace, Harrow, Middlesex.

MANUFACTURERS of sectional water storage tanks, 50 to 40,000 gallons capacity. Sewage and Effluent Pumps. G. L. Murphy Limited, Imperial Works, Menston, Nr. Leeds.

PATENTS

J. OWDEN O'BRIEN & SON

CHARTERED PATENT AGENTS

Agents for procuring Patents and Registering Trade Marks and Designs
Lloyds Bank Bldgs., 53 King St., Manchester
Telephone No.: BLAckfriars 7782

TWO-AND-A-HALF ton Morris Mobile Crane, unused and guaranteed as new, at half list price. Alan R. Davies Ltd., 20 Whiteladies Road, Bristol 8 (Tel.: Bristol 38418).

Cloth Cleaning, Shearing, Cropping Machines, Brushing Machines, Folding and Plaiting Machines Rolling and Measuring Machines Rigging, Doubling and Folding Machines

A. & H. SIMONETT (Engineers), LTD.

West Holme Works, Bradford, Yorks
Telephone: Bradford 22381/2

Factories

MALDON, ESSEX. New single-storey factory just completed near town centre. Nett floor space 6,000 sq. feet. Good access from service road with two entrances and rear yard. Additional land for extension if required. All services. Price £11,000 freehold or might let. Apply Estate Manager, 18 Upper Brook Street, W.1.

Offices to Let

MANCHESTER. Excellent suite of offices to let, with ample good storage space if required, in substantial, attractive and well-maintained building in best situation of City, near Central Station and Midland Hotel. Floor area approximately 1,500 sq. feet (offices) and 1,700 sq. feet (storage space). Loading bay, two goods hoists, passenger lift, central heating, dual-supply sprinkler installation, very attractive reception room, resident caretaker. Please apply to L. A. Mitchell Ltd., Harvester House, 37 Peter Street, Manchester 2.

Education

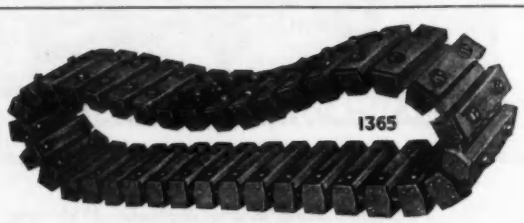
COVENTRY TECHNICAL COLLEGE
COURSE ON NEW TECHNIQUES IN TEXTILE MANUFACTURE

A short course of five lectures will be held on Friday and Saturday, 16th and 17th October, 1959. Course fee: £1.1s.0d. Particulars from the Head of the Chemistry Department.

Export Opportunities

AUSTRALIA
FURNISHING MATERIALS AND MATTRESS TICKINGS

G. W. J. Blackman and Co. Ltd., 83 Grenfell Street, Adelaide, with branches in all capital cities, wish to receive offers from manufacturers leading to exclusive agency agreement. Please write to London Office, 3 Copthall Buildings, Copthall Avenue, E.C.2.



Telephone: BRADFORD 41251 (5 lines)
Telegrams and Cables: Lindsay Bradford Telex (Telex No 51147)

WIDE-VEE BELTS FOR SPEED-VARIERS
Spare belts for the Lindivarier from stock

Belts made specially for other makes of Speed Varier and Expanding Pulley. Jointed or endless. To suit flat driven pulley when required. Please give fullest particulars, sending a specimen belt if at all possible.

Mechanical **HENRY LINDSAY LTD.** *Engineers*
P.O. Box 97, Mansfield Road, Bradford 8, Yorkshire